BETTER PERFORMANCE, LONGER FLIGHTS

page 36

MODEL Airplane NEWS

EXTREME AEROBATS

EXPERIENCE THE THRILL!

CITABRIA
Easy-build aerobat

PT-19
Warbird trainer

LASER 2000
Giant-scale performance

DEMOISELLE
Electric ultralight

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MODEL Airplane NEWS

MARCH 2003 VOLUME 131, NUMBER 3

ON THE COVER: showmanship at its best! Caught mid-hover during the freestyle portion of the TOC competition, Roland Matt's impressive 3W Extra 300S paints the aerobatic box with red smoke! (photo by John Reid)
ON THIS PAGE: Super Kraft Laser 2000 (photo by Walter Sidas).

FEATURES

CONSTRUCTION

FLIGHT TESTS

COLUMNS

DEPARTMENTS

Ultimate RC

Where do world-class aerobatic pilots go to see who's the best? Las Vegas! At the **18th Tournament of Champions**, 21 pilots from around the globe met to compete and hoped to take home a portion of the $186,000 purse. This year, West Coast associate editor John Reid was on hand to capture the action on film; check out his tournament coverage on page 28 to see who was awarded the $50,000 first-place prize!

A NEW BREED OF BATTERY

Looking for the latest in battery technology? Check out Bob Aberle's report on the development, use and attributes of **lithium-polymer cells**. This new breed of battery offers higher voltage in a smaller, lighter package than Ni-Cd or NiMH cells of comparable capacity. If you want to increase the flight times and performance of your small electric model, this is one article you won't want to miss! If you'd like more information on using lithium-polymer cells and flying small RC airplanes, check out the Click Trip of articles from our sister publication *RC MicroFlight*.

IN THE WORKSHOP

Besides adding the finishing touch to aluminum landing gear, wheel pants also decrease drag and help to increase your model's performance. It's easy to **add removable pants** that don't come loose in flight; see Rick Bell's step-by-step how-to article on page 76.

Functional, realistic control surfaces are a must-have for scale competition. In his "Scale Techniques" column this month, Dick van Mourik discusses scale construction techniques for **building functional ailerons, flaps and slats**.

Also in this issue, scale expert Vance Mosher presents a beautiful CAD-designed, **.25-size Fairey Firefly**. Because the full-size British WW II fighter-bomber also served in the Korean War, there are several attractive, unique paint schemes from which to choose; this unusual subject is sure to turn heads at any flying field or scale meet. Warbird enthusiasts will also appreciate Budd Davisson's tribute to the world's only fully restored, flightworthy Fairey Firefly.

HITEC FIELD GRANTS

Thanks to the generosity of Hitec USA, 10 U.S. RC clubs—including seven airplane clubs!—have won $1,000 Field and Track Improvement awards. We join Hitec USA marketing director Glen Merritt in congratulating the following RC airplane clubs: the Alexandria R/C Flyers of Miltona, MN; the Coachella Valley R/C Club of Bermuda Dunes, CA; the Boerne Area Model Society of Boerne, TX; the Southern Tier Aero Radio Society of New Jersey; the Oswego Valley Modelaires Inc. of Hannibal, NY; the Ithaca Radio Control Society of Ithaca, NY; and the Wyoming Modelers Park Association of Riverton, WY. Glen writes, "We would like to thank all the members of all the great clubs and organizations out there who work hard at providing a place for modelers to fly, float and drive."

MODEL Airplane NEWS
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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

FIELD ACCESSORIES

I just finished reading your guide "Hot Field Accessories" in the December 2002 issue. You show some really neat field-box filler-uppers, but you did not talk about the battery needed for electric starters. I am working on a G-62-powered AT-6 Texan I built from Nick Ziroli plans, and I plan to buy the Megatron starter you featured in the guide. How large a battery should I use, and are there any 24V batteries out there? You say that the Megatron can be used with 12 or 24 volts. Thanks for a great magazine.

RALPH HOLLISTER,
Miami Beach, FL

Ralph, thanks for the praise. The Megatron two-handle starter is wonderful for any giant-scale modeler, especially those who run the very large gas engines. I hardly ever hand-crank my big gassers now that I have the Megatron. With any big electric starter, you should use a lawn/tractor-variety battery or an automobile lead-acid battery. For my Megatron, I use a Nautilus-brand, 100A deep-cycle battery. This marine-grade starter battery is designed to go a long time between starting cycles and to retain its charge two or three times longer than a typical automotive battery.

To get 24 volts, simply connect two batteries in series. I don't know of any 24V batteries, but perhaps there are some intended for full-size-aircraft aviation use. GY

HARDWARE-STORE PAINTS

I have usually relied on the model industry for the paints I need, but to save money, I have turned to paints outside the industry. I'm concerned about these paints' ability to fuelproof my model against glow fuels. What do you think about the hardware-store paints such as Rustoleum (enamel) and Duplicolor (acrylic lacquer). I would appreciate any comments on the suitability of these paints for models. [email].

HENRI DOUVILLE

Henri, I have used Rustoleum several times to paint glow-powered models, and it works very well indeed. It comes in a large assortment of colors and is available in spray cans and as brush-on paints. You must apply it in "mist" coats to build up the layers without its running, and you must let it dry completely between different color coats. Once I have sprayed on a base coat, I let the model dry in a clean, well-ventilated area for at least three to five days. Then I wipe the model with a tack-cloth, mask

off the trim areas and apply the next color. If you apply new paint over a "dry" layer before it has completely set, the new coat of paint can soften and ruin the previous layer.

Acrylic lacquers generally require a clear top coat to be fully fuelproof. Use a good polyurethane clear coat, and apply two or more coats around the firewall and exhaust outlet. Some polyurethanes have a yellowing effect, so test your paints and make sure that they are compatible. I think the best clear coat is LustreKote from Great Planes. It's a little more expensive than hardware-store paints, but it doesn't yellow and produces a very smooth, tough surface. I even clearcoated my motorcycle with it! GY

PITTS POWER

I just finished reading the flight test of the Kyosho Pitts S-26 40 in the October 2002 issue. Great review!—so good, in fact, that I'm going to buy a Pitts. You powered your Pitts with an O.S. .46FX 2-stroke, but for this plane, I would much rather use a 4-stroke. Kyosho recommends a maximum of a .50 4-stroke, and I would like to install an O.S. Surpass .70. What are your opinions on this combo? Would you do it? If you wouldn't, what size of prop would you recommend for a Surpass .52 and this plane? Any help will be greatly appreciated. [email]

ROBERT D.

Robert, I'm glad you enjoyed the Pitts review; it's a great flyer with any engine in Kyosho's recommended range. My Pitts can do any maneuver I ask it to. Vertical performance is good, but not unlimited. I used a 2-stroke engine to save weight. I used the stock muffler and a 1200mAh battery. If you use an O.S. .70 Surpass 4-stroke, performance will definitely be increased. Just be sure you balance the model properly. Because the Surpass .70 is heavier than the .46, you'll have to move the receiver and/or the battery aft to achieve the correct CG. I hope this information helps you enjoy your Pitts! RB

GREAT PHOTOGRAPHS!

I have been reading *Model Airplane News* for over 20 years, and your in-flight photography is the best. What's the secret? When I go out to the flying field, I try to take photos of my planes while I have someone else flying them. I don't even come close to your shots. Come on! Tell us the secret!

JOEY ROSS,
Dayton, OH

Joey, thanks for the encouragement. But there really isn't any secret. We have talented photographers and use professional cameras to capture those great action shots at events and during photos shoots of review models. Our standard rig is a Nikon F5 with a Nikor 300mm lens. We use Fuji 100 ASA slide film, and we shoot both in manual and in autofocus modes, depending on the subject. Basically, we shoot a lot of film to get that "just right" shot!

If you want to learn more about taking model airplane photos, take the Web Click Trip and check out Jerry Smith's in-depth article. Jerry has been taking flight shots for years, and he has it down to a fine science! Just like everything else worth doing right, the secret to getting great photos is practice, practice and more practice. GY

click trip
MODELAIRPLANENEWS.COM

NEW PRODUCTS OR PEOPLE hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

AIR SCOOP

by the Model Airplane News *crew*

AVIOMODELLI

CESSNA 02A/B SKYMASTER

If you like the quick assembly time of ARFs but wish you could cover your models yourself, an Italian company may have the answer: "50-percent ARFs." These planes feature prebuilt sub-assemblies such as laser-cut wooden fuselages and wings, and they come with accessories, plans and building instructions, but you can finish the models in any way you choose. Take this Cessna Skymaster, for example: it comes with a built, laser-cut wooden fuselage and built, foam-core-and-balsa, vinyl-covered wings, but you can finish it in civilian, U.S. Air Force or Navy decorations. The Skymaster retails for $349.99. Specs: wingspan—86.6 inches; length—45.7 inches; weight—14 pounds; radio required—5- to 6-channel; engines recommended—two .40 to .47 2-strokes or .90 4-strokes. Dealer and/or distributor enquiries welcome.

Aviomodelli; distributed by Internet-RC Radio Control (602) 320-7114; internet-rc.com.

GWS

FUNNY PARK

With the excellent aerobatic capability as well as the same great slow-flight characteristics as the GWS Slow Stick, this new park flyer ARF is sure to fly off hobby-store shelves! The model comes with a 370 geared motor and should be flight-ready in just a few relaxed evenings of assembly.

GWS; distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.

ROBART MFG.

Pneumatic Disc Brakes & Tuff Tread Wheels

Looking for a truly pneumatic disc brake? Designed to fit inside Robart's new Tuff Tread aluminum wheels, these new brakes are available for 4- to 4.25- and 5- to 6-inch wheels; each pair costs $119.95. Tuff Tread wheels have a tough outer skin, a softer inner core and a low-bounce design; they're available in 4- to 6-inch diameters and come with a machined-aluminum hub with 8 or 10 spokes, a smooth hub or a scale P-51 hub. All aluminum hubs have replaceable bearings. The Tuff Tread wheels cost from $58 to $95.

Robart Mfg. (630) 584-7616; robart.com.

GREAT PLANES

Lancair 60 ARF

Here's one for you giant-scale fans, and this one is one of a kind. The new Lancair 60 from Great Planes is the first ever almost-ready-to-fly model of a high-performance homebuilt airplane (the only one that we know of, anyway). Constructed of high-quality wood and strong, but light fiberglass and covered in MonoKote, the Lancair features aluminum-spar joiners for the stabilizer, a tricycle landing gear, painted-fiberglass wheel pants and a complete set of hardware. Its 80-inch wing is equipped with ailerons to provide the Lancair with incredible aerobatic capabilities. It requires a .61 to .75 2-stroke or a .91 4-stroke engine and sells for $299.99.

Great Planes Model Mfg. (800) 682-8948; greatplanes.com.

SPORTSMAN AVIATION

WACO 60 ARF

Featuring the same high-quality craftsmanship as you've come to expect from Sportsman Aviation ARFs, the Waco has a light wood construction, iron-on covering, a painted fiberglass cowl, aluminum landing gear, an extensive hardware package and a detailed instruction manual. The Waco has a list price of $299.95. Specs: wingspan (top/bottom)—58/51.5 inches; total wing area—1,002 square inches; length—45.25 inches; weight—7.5 to 8.5 pounds; engine recommended—.60 to .75 2-stroke, or .80 to .91 4-stroke; radio required—4-channel with 5 servos.

Sportsman Aviation; distributed by Global Hobby Distributors (800) 854-8471; globalhobby.com.

HIROBO

XRB Mini Lama

Whether you're a scale buff or a helicopter enthusiast, or you just want to learn how to fly helis, the XRB Mini Lama is sure to please. Take a break from your computer flight simulator this spring, and fly a scale heli in your living room! This indoor helicopter features an incredibly stable rotor system and main blades that are designed to break on impact (instead of damaging the helicopter or your walls!). The Mini Lama comes packaged ready to fly with a 15-foot tether cord, 4-channel radio transmitter, universal power supply and spare blades; it retails for $299.

Hirobo; distributed by MRC/Altech (732) 225-2100; modelrectifier.com.

456 MB

Dragon ARFs

Hot Bodies has been a trusted name in the RC car industry for years, and with the recent introduction of the A-7 Corsair and Sky Wave, it's quickly earning its place among the top airplane manufacturers as well. Its recent aviation endeavors have been so successful, in fact, that Hot Bodies created an entire division of RC aircraft, and the Dragon is the first offering in what is sure to be a popular line of airplanes. Available as a small, ready-to-fly electric version using 3 or 4 channels, as a .40-size, gas-powered model (both RTF and ARF) and as a 1.60-size, gas-powered ARF, the Dragon is made of balsa and ply and covered with an iron-on film.

The Dragon is the first of several new models that will be available in a variety of sizes and versions—a practice expected to be applied to every 456 MB model.

456 MB; a division of Hot Bodies (909) 296-9340; hotbodiesonline.net.

HOBBY LOBBY

JETI ADVANCE SPEED CONTROLS

Having a tough time finding the perfect speed control for your new brushless motor? Look no further than the new Jeti Advance (6 to 12 cells) and Jeti Advance Opto (6 to 16 cells) brushless controllers. Both are available in 40 and 70A versions and may be programmed for a soft or hard cutoff. They feature a more linear throttle operation, operate more efficiently and use less current than many brushless controllers on the market. Sounds indicate timing changes, brake on or off and arming, and each controller automatically adjusts itself to the motor on first use. The Opto controllers isolate the electronics from the receiver to reduce the possibility of radio interference, but they don't have a battery eliminator circuit (BEC). The BEC in the non-Opto controllers will support four to five servos. Specs: dimensions—2x1 1/8x3/8 inches (40 amps), 2x1 1/8x1/2 (70 amps); weight—1 ounce (40 amps), 1 3/8 ounce (70 amps); prices—$107 (40 amps), $139 (70 amps).

Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com

GIANTSCALEPLANES.COM

F6F HELLCAT

One of a new line of smaller ARFs offered by Giantscaleplanes.com, this Hellcat features a fiberglass fuselage, built-up, cloth-covered wings and a classic dark blue and gray paint scheme. Built-in, workable flaps, beveled-leading-edge control surfaces and installed control-horn mounts are nice touches. The model can be fitted with fixed landing gear or 90-degree, rotating retracts. The Hellcat costs $349.99. Specs: wingspan—70 inches; length—53.5 inches; weight—10 to 10.25 pounds; engine recommended—.91 2-stroke, or .91 to 1.20 4-stroke; radio required—5- to 6-channel with 6 or 7 servos.

Giantscaleplanes.com (610) 282-4811; giantscaleplanes.com.

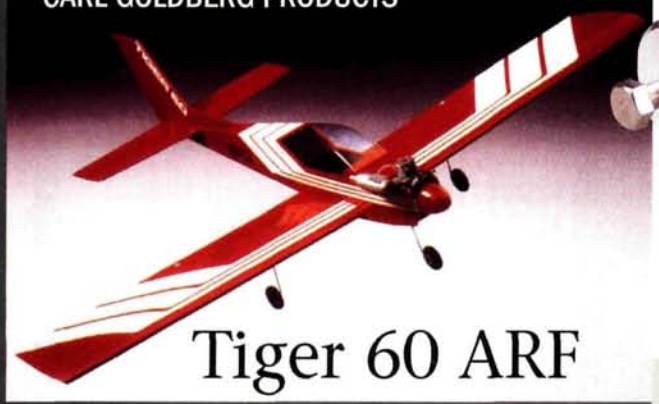
FUJI ENGINES

BT-64A

The Fuji name stands among the leaders in RC gas-engine technology thanks to its ability to produce powerhouses such as this new BT-64A. In addition to the many great features it shares with other Fuji engines (including an automatic timing module [ATM] and heat-resistant cylinder head coating), the BT-64A also features powerful Mighty Mag flywheel magnets that work with the ATM for extra-easy hand starting, and an insulating plate prevents engine-heat buildup from affecting the carburetor settings. It can be used with the same mount as the BT-50SA. The BT-64A comes with a Walbro carburetor, a Champion resistor spark plug, a muffler and a mount for an optional spring starter. It weighs 4.8 pounds (with muffler), has a displacement of 63.1cc, a practical rpm range of 1,300 to 7,200 and puts out 5.7hp at 9,000rpm; it sells for $449.99.

Fuji Engines; distributed by Great Planes Model Distributors (800) 682-8948; greatplanes.com.

CARL GOLDBERG PRODUCTS



Tiger 60 ARF

For years, trainer graduates have turned to Carl Goldberg's Tiger 60 to take the next step in their RC aviation education. After all, it's light, has a low wing loading, tricycle landing gear and gentle flight characteristics, so it's the perfect choice. Now, with the introduction of the Tiger 60 ARF, Carl Goldberg makes it even easier to take that next step. Hand-built using a jig alignment system to ensure a straight, true airframe, the Tiger 60 ARF comes finished with iron-on covering and with a complete set of hardware. Like its predecessor, this new ARF Tiger also features a symmetrical airfoil and long tail moment to produce the amazing aerobatics all you sport fliers have come to expect and enjoy from this docile flyer. The Tiger 60 ARF can be assembled in just a few hours, and it sells for $209.99.

Carl Goldberg Products Ltd. (678) 450-0085; carlgoldbergproducts.com.

ICARE SAILPLANES

Nooner and Freestyle Motors

Electric enthusiasts will love these two new offerings from ICARE Sailplanes. For starters, check out this 36-inch-wingspan, Speed 400-powered Nooner. Its low wing loading, relatively large wing area and high-aspect wing planform provide this little racer with fast, but stable, flight characteristics. The Nooner comes almost ready to cover and features a balsa-sheeted wing with precut ailerons, a lightweight fiberglass fuselage and a complete hardware package. It sells for $99.

In addition to the Nooner come the new Plettenberg Freestyle 20 and 24 brushless motors. Designed specifically for small electric planes, these little powerhouses pack a lot of torque into a small, light package. Freestyle motors can turn relatively large-diameter and high-pitch props without a gearbox. They're also extremely efficient. They sell for $129.

ICARE Sailplanes (450) 449-9094; icare-rc.com.

TIPS & TRICKS

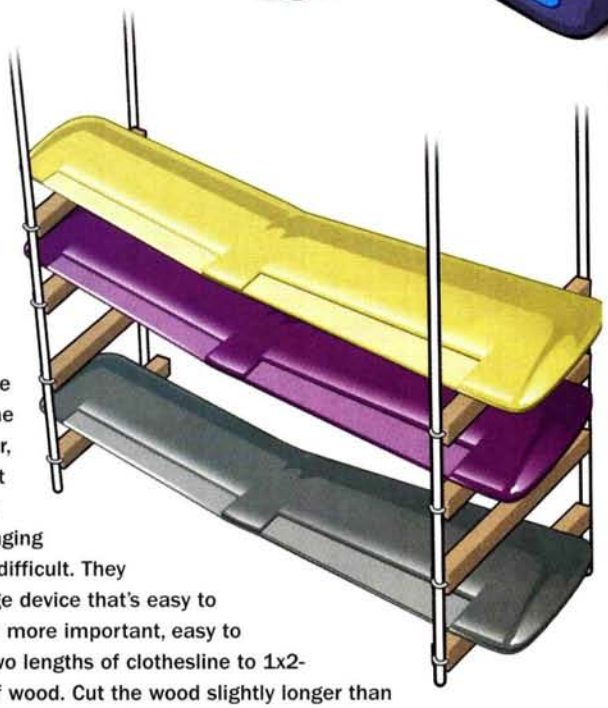
Illustrations by David Baker

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

CLEAN UP YOUR ACT

After a great day of flying, you have to clean the gooey exhaust residue off your plane. Instead of carrying a spray bottle of cleaner and paper towels or rags to the field, why not reach for a baby wipe? They're in a handy dispenser, they work great, and unlike other cleaners, they don't leave any residue.

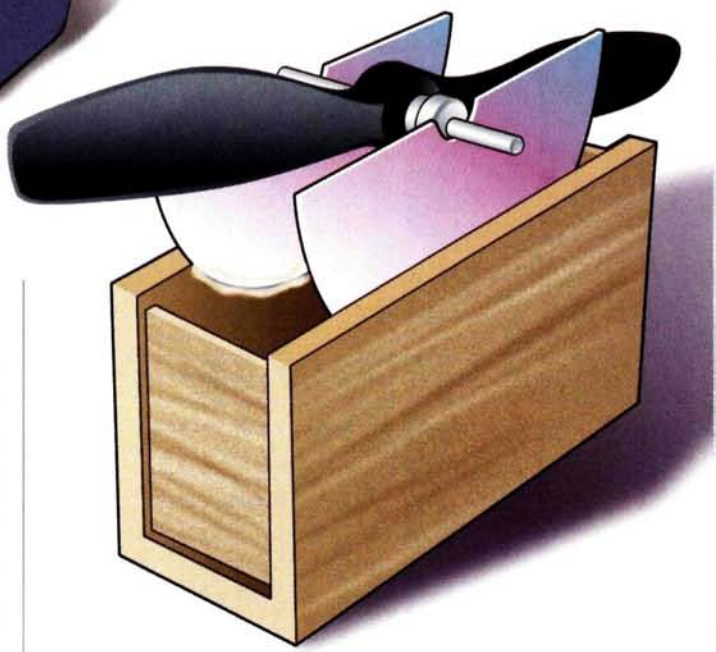
Steve Bushong, Midland, TX



HANG IT UP

If you have more than one model airplane in your hangar, you know that storing wings without damaging them can be difficult. They need a storage device that's easy to construct and more important, easy to use. Staple two lengths of clothesline to 1x2-inch pieces of wood. Cut the wood slightly longer than the width of the wing(s) to be stored and space them so that the wings will easily slide between them. Before you staple the rungs to the clothesline, lay both lines side by side and mark them with a permanent-ink marker. Hang your new storage rack in a convenient spot, and load it from either side.

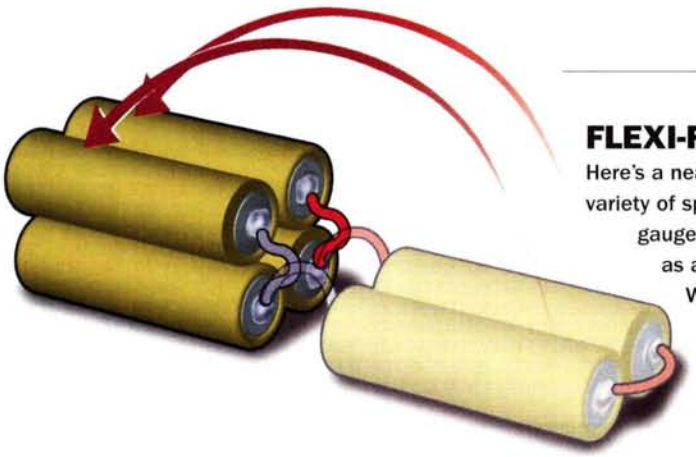
Raymond Brandoli, South Windsor, CT



RECYCLE THOSE CDs

We all get those annoying CDs in the mail; why not put one to good use to make a stand for balancing propellers? Cut a CD in half, and smooth the edges. Carefully align the halves and then glue them to a small wooden box. Now put that fingertip prop balancer on the very smooth edges of the CD. The edges are almost frictionless, and that makes it easy for you to balance your props precisely. Be sure to do this on a level surface.

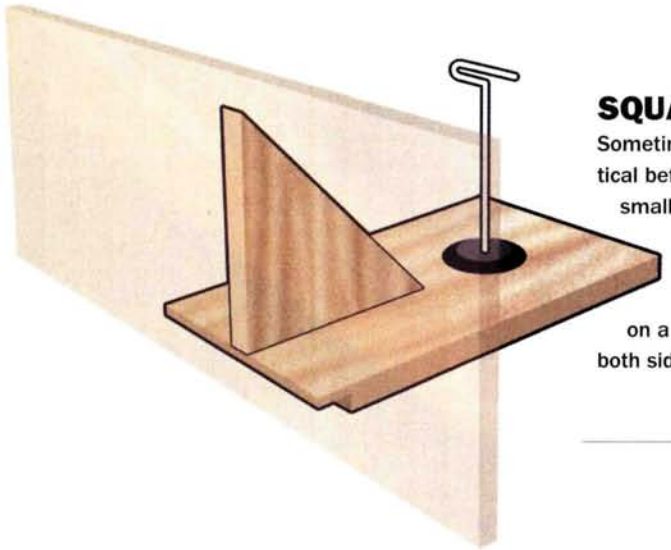
Hisham Bujawdeh, Beirut, Lebanon



FLEXI-FLYERS

Here's a neat tip for using a 7- or 8-cell battery pack in models that have a variety of space considerations. Join two 4-cell packs in the middle with 14-gauge wire to make an 8-cell pack. Make the wire long enough to act as a hinge so you'll be able to stack the packs on top of each other. When soldering the packs together, be sure to avoid wicking solder along the entire wire; you need it only at the battery terminal.

Dr. Raymond Stelzner, San Diego, CA



SQUARE CITY

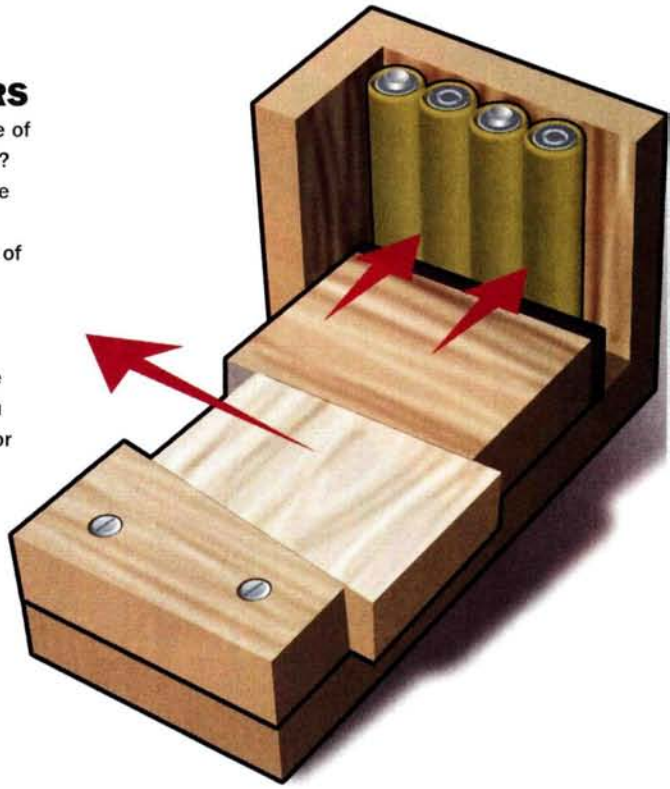
Sometimes, you need a third hand to hold formers and ribs perfectly vertical before you glue them, so a jig is good to have. It's easy to make small jigs out of ⅛-inch-thick balsa or plywood from your scrap-wood box. Cut a triangular piece and glue it to a wooden base that measures 1x½-inch. Undercut the front of the base as shown so CA won't stick it to your work surface. Also true the right angle on a 90-degree disc sander. Make several such jigs, and use them on both sides of formers and ribs for perfect alignment.

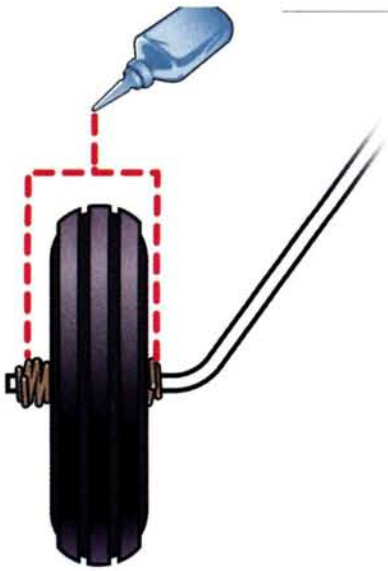
Ken Horrill, Nelson, New Zealand

MINIATURE BAR SANDERS

Do you ever have the need to sand a piece of wood where your trusty bar sander won't fit? At your local craft store, you can buy Popsicle sticks for mere pennies, and they can be made into mini bar sanders. Stick a piece of self-adhesive sandpaper to one side of a stick, and trim it to size. Take a second stick, cut off the round ends, and glue it to the back of the first stick to make a handle. Now you have a handy, inexpensive bar sander for those small jobs. Make several of different sizes and with various grades of sandpaper.

Jack Dundas, Ontario, Canada





EVER HAVE THIS HAPPEN TO YOU?

You're out flying your latest park flyer and one of the wheels falls off. You know you'll never find the tiny plastic wheel retainer in the grass. Why not take a short piece of no. 20 copper wire and wrap a couple of circles around the gear axle? Snip the end so you end up with a small coil that can be secured to the axle with a drop of thin CA. Be careful not to get CA on the wheel hub!

Don Swinehart, Mansfield, OH

EASY BATTERY JIG

Making your own battery packs is a great way to save some money, but holding the cells steady while you solder them together can be a challenge. A simple jig made from ordinary materials will hold the cells in alignment. The jig shown here is very versatile and can accommodate cells of various sizes; just slide the wedge back and forth to clamp the cells into place. Make the jig as wide as the longest pack you're likely to make.

William Blackham, Avon, CT

PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Charlie Mikolajczyk
Temperance, MI
EXTRA 300S

Charlie sent us this photo of his daughters Beth (left, a recent graduate of the University of Michigan) and Lianne (right, a Michigan State alumna) holding his Extra 300s. The plane Beth is holding is from an Ohio RC kit and is powered by an MVVS 1.20 twin. The second Extra is an ARF from ISC that's powered by an MVVS 1.40 twin. The models use Futaba radios to perform exciting aerobatics, and they wear the colors of each girl's alma mater.

Jim Tiller
Rapid City, SD
SEA DANCER

Jim scratch-built this sharp-looking Sea Dancer from a plan set that he bought. The seaplane is powered by a K&B .60 and swings a 3-blade propeller; he slightly altered the shape of the tail feathers to better accent the UltraCote color scheme. Jim tells us that his Sea Dancer is a veteran of several club float-flys.

Charles Vettes
Rancho Cucamonga, CA
GREAT PLANES GIANT AEROMASTER

It took Charles three months to complete his latest project: the Great Planes Giant Aeromaster. The 23-pound biplane is covered with Solartex fabric and powered by a Zenoah G-62 with a C.H. ignition. He uses a Hitec receiver and servos combined with a Futaba Super 8 transmitter for exciting flights. Charles tells us that this is his first gas-powered model, and he really likes the inexpensive fuel the model uses.

Warren Hastings
Invercargill, New Zealand
LAZY BEE

Warren submitted this photo of Les Stewart's Lazy Bee. Les built the Bee for his wife, Maria, who has yet to fly the model. She just can't seem to get the transmitter away from her husband; we guess he's having too much fun flying the Bee! The colorful fun flyer has no dihedral and is powered by an O.S. .20. We hope that Maria will let us know how the Bee flies!

Achille Silvestri
Bel Air, MD
KIT-BASHED SIG FOUR STAR 60

Achille enjoys WW I-style airplanes, and whenever he gets a chance, he bashes a kit into a WW I lookalike. Having built several Four Star 60s, he realized that the design could easily be modified. He deepened the fuselage and added an open cockpit and a machine gun. He also added the aileron tips so characteristic of WW I planes and reshaped the tail feathers. Achille uses a SuperTigre .75 for power, and although the model does not replicate any full-size plane, flying it gives him a lot of pleasure.

Richard Flinchbaugh
South Dennis, MA
SCRATCH-BUILT 1941 TAYLORCRAFT

Rich flew in his first airplane when he was 15; it was a Taylorcraft very much like the one in the picture. His scratch-built floatplane has a 56-inch wingspan, and what makes his model unique is that it's electric powered. It uses a Mega 22/20/3E brushless motor and a Castle Creations Phoenix 35 sensorless speed control. Rich reports that with eight Sanyo CP1700 Ni-Cds, the plane gets off the water fast and easily flies for 10 minutes.

Larry Bennington ▲
Eden, UT
SCRATCH-BUILT P-51

It's difficult to believe that Larry's P-51 Mustang is 26 years old! He originally designed and built the fighter from a plastic model kit for the 1977 Nats. He modeled it after a full-scale P-51 that landed during the competition at the Tucson Winter Nationals the year before. The plane is 1/7 scale and has working flaps, retracts, sequencing doors and a radiator door, and it's powered by an OPS Ursus .60 engine. Originally finished in K&B SuperPoxy over fiberglass cloth and polyester resin, Larry recently repainted the classic fighter with Perfect Paint. After a 21-year hiatus, Larry plans to fly the model again.

◀Donald Bastien
Peoria, AZ
TOP FLITE AT-6 TEXAN

Donald modeled his Top Flite Gold Edition AT-6 to represent the AT-6s that flew out of Luke AFB back in the early 1940s. An O.S. 91FX 2-stroke engine powers the military trainer; it weighs 10½ pounds and has a 70-inch wingspan. He added working navigation lights as well as landing lights that turn on when the gear is lowered. Donald says that it took him 16 months to complete the model, and it flies like a dream.

Dan Poe
Oak View, CA
PA-18 SUPER CUB

Dan used the popular Super Cub kit from Dynaflite and documentation from Bob's Aircraft Documentation, and he ended up with this very nice military Cub. Dan covered the plane with Sig Koverall and finished it with nitrate dope and Nelson Hobby Specialties System 3 paint. He detailed the model to include rib stitching, cowl panel lines and fasteners, an opening door and functional main gear. The cabin has a Diamond Panels dashboard and a Vailly Aviation full-body pilot. A Saito 1.50 4-stroke powers the beautiful model, and Dan plans to display the Cub at the next IMS R/C Hobby Show.

Frank Kaylor
Centennial, CO
DOUBLE TROUBLE

This is Frank's first scratch-built plane, and it's a twin, to boot. The profile model has a sheeted-foam wing, and the fuselages are built up of balsa and plywood. The model spans 58 inches, is powered by two O.S. .25FX engines and weighs 5½ pounds. Frank covered the twin with MonoKote and uses a JR receiver and seven JR servos for control. Frank tells us the model flies great—even on one engine.

EXTREME AEROBATS

18th annual Tournament of Champions

by John Reid

At the 18th annual Tournament of Champions (TOC) in Las Vegas, NV, last October, the competition was fierce, and the flying—spectacular! How could it be anything else? Twenty-one of the world's best aerobatic RC pilots (11 from the U.S.!) were invited to this five-day contest to compete for a portion of the $183,500 in total prize money, with the first-place winner earning a check for $50,000. William G. Bennett and the Sahara Hotel organized and sponsored the entire event.

Ultimate champion

The only biplane in the entire TOC lineup was the prototype Aeroworks model that Chip Hyde flew to victory. Two months before the TOC, Chip received two almost-ready-to-cover (ARC) prototype Ultimates. In that short time, he was able to cover the planes and install all of the hardware, control surfaces, engines and radio systems. After that came the test flights and the practice to learn all of the plane's attributes. The Ultimates' flying characteristics worked well with Chip's flying style and contributed to his success at the TOC.

Caller Mike Klein gives Chip Hyde a taste of the victory champagne.

Take the Click Trip to read in Chip's own words how the Aeroworks Ultimate helped him enter the winners' circle at TOC.

click trip MODELAIRPLANENEWS.COM TO HEAR FROM CHIP HYDE.

PHOTOS BY JOHN REID

While in a low-torque roll, Chip Hyde walks around his Aeroworks Ultimate.

Mike McConville's Carden Extra 330 blows into the sky during his 4-minute free program.

How the scores add up

To better understand how the pilots are scored at the TOC, let's look at the three flight programs that are used to judge each competitor.

• **Known program.** Before the contest, a list of 25 known maneuvers is given to all pilots. The night before these patterns are to be flown, each competitor is given the next day's known and unknown compulsory program. The known compulsory program comprises 10 to 12 maneuvers from the list of 25 known maneuvers. These must be flown in the order described in the program. Each pilot can choose the direction in which he will fly the program, but once he starts, he must perform all of the maneuvers from that direction. Top score for the known sequence is 3,500 points.

The judges and their callers prepare for the next contestant. Each judge closely watches the entire program, while a caller reads the Aresti diagrams in the order in which the maneuvers should be performed.

• **Unknown program.** The unknown compulsory program comprises 10 to 12 maneuvers that the pilots see for the first time the day before they will fly. Both the maneuvers and the order in which they must be executed are new to the pilot. The contestants and their helpers study the unknown program that night and hope to perform the program flawlessly the next day. A perfect execution of the unknown program earns a pilot 5,000 points.

• **Four-minute free-style program.** This is a chance for the contestants to show off. Aerobatically, anything goes in this round, and the competitor can use music and other special effects to enhance his performance. These four minutes are always the highlight of the TOC. A flawless performance is awarded 1,500 points.

THE EVENT

The TOC spanned five days of fierce competition. The first three days were devoted to the preliminary rounds, in which each pilot had to fly a known program, an unknown program and a 4-minute free-style program each day. Chip Hyde was in first place on Friday evening, with Christophe Paysant-Le Roux, Jason Shulman and Quique Somenzini following sequentially.

Only the top 14 pilots from the preliminaries moved on to the semifinal round, with the highest known flight scores carried into the semifinal. Peter Goldsmith suffered from a broken prop in the third preliminary unknown flight, giving him 0 out of a possible 5,000 points; he missed 14th place by only 13 points! Marco Benincasa also had some mechanical problems: his rudder flew off during his 4-minute free-style flight, and he had to land his plane using just the ailerons!

Christophe Paysant-Le Roux's ZN Line Extra 330 sports a full streamer and smoke during the 4-minute free-style program.

On Saturday, the 14 semifinal competitors flew two unknown flights and two 4-minute free-style flights (the crowd's favorite!) as they tried to win one of the

2002 Tournament of Champions Scores

Pos.	Pilot	Country	Aircraft kit	Span (in.)	Weight (lb.)	Power	Prop	Radio
1	Chip Hyde	USA	Aeroworks Ultimate	99.5	41.5	Desert Aircraft 200	32x10	Futaba w/15 servos
2	Christophe Paysant-Le Roux	France	ZN Line Extra 330S	119	35	Desert Aircraft 150	32x12	Futaba w/13 servos
3	Quique Somenzini	Argentina	Wayne Ultry Yak 54	120	41	3W-150	31.5x12	JR w/17 servos
4	Roland Matt	Liechtenstein	3W Extra 330S	118.1	38	3W-150	32x12	Futaba w/14 servos
5	Jason Shulman	USA	FiberClassics Extra 330	119	34.5	Desert Aircraft 150	32x10	Futaba w/16 servos
6	Mike McConville	USA	Carden Extra 330S	118	40	Desert Aircraft 150	31.5x12	JR w/13 servos
7	Sean McMurtry	USA	Aeroworks Extra 300L	117	36	3W-150	32x10	Futaba w/14 servos
8	Frazer Briggs	New Zealand	PBG Composites Extra 260	122.5	37.5	Desert Aircraft 150	32x10	JR w/13 servos
9	Fabio Trento	Brazil	Aeroworks Extra 300L	117	39.1	Desert Aircraft 150	32x10	Futaba w/14 servos
10	Bernd Beschorner	Germany	Delro Modeltech Raven	114.2	35.2	3W-150	30x12.5	Graupner w/13 servos
11	Mike Caglia	USA	Troy Built Extra 260	122.5	33.5	Desert Aircraft 150	32x10	Futaba w/13 servos
12	Bill Hemple	USA	3W Extra 330	118	38	3W-150	31.5x14.8	Futaba w/14 servos
13	Sebastiano Silvestri	Italy	Exclusive Model Katana	112	39.1	3W-150	32x10	JR w/17 servos
14	Kirk Gray	USA	Carden Extra 330S	118	41	Desert Aircraft 150	30x12	Futaba w/10 servos
15	Peter Goldsmith	Australia	Own design CAP 232	131.5	43	Desert Aircraft 150	32x10	JR w/13 servos
16	Ryan Taylor	USA	RadioCraft Extra 330L	123	38	Desert Aircraft 150	32x12	Futaba w/13 servos
17	Dave Von Linsowe	USA	Troy Built Extra 260	122.8	34.5	Desert Aircraft 150	28x12	Futaba w/12 servos
18	Marco Benincasa	Italy	FiberClassic Extra 330	118.1	35.2	Desert Aircraft 150	30x10	Futaba w/14 servos
19	Don Szczur	USA	FiberClassic Extra 330S	119	34	Desert Aircraft 150	32x10	JR w/14 servos
20	Chris Lakin	USA	Carden Edge 540	118	40	Desert Aircraft 150	32x12	JR w/13 servos
21	Arnaud Poyet	France	ZN Line Extra 330S	119	38.5	Desert Aircraft 150	30x15	Futaba w/13 servos

Champion aircraft

The planes that fly at TOC are built months in advance especially for this competition. The pilots will run between 50 and several hundred flights just to fine-tune and get a feel for their planes. Four basic modifications set TOC planes apart from other aerobatic planes.

• **Weight.** The planes are built to be as light as possible. This is a big advantage for a 3D aerobatic plane. Lighter planes provide more power reserve for maneuvers that need it.

Sean McMurtry prepares his Aeroworks Extra 300L for competition.

• **Size.** You'll often hear pilots say that the plane "presents" well. This is accomplished by its size; larger planes fly more like their full-size counterparts because they tend to be more stable and fly better. They are also easier to see. Many of the judges at TOC also judge full-scale aerobatics, so a plane that presents well will also score well.

• **Balance.** In past TOC competitions, the planes were constructed with their centers of gravity (CG) farther back to make them more responsive. Of course, this made the plane unstable and harder to control for straight and level flight. Modern TOC planes have CGs that are toward the nose of the plane, so they present better on straight and level flight.

• **3D capability.** Radical maneuvers are possible because of large control surfaces and significant amounts of deflection or movement. The stress is tremendous on these surfaces, particularly during 3D maneuvers, so these planes have two, three, or more servos on each control surface.

Showtime!

During breaks in the action, spectators enjoyed some different types of RC flying. The Hacker team demonstrated some impressive flying of its electric-powered aircraft. Using the new Hacker 3D motor in two 80-inch-span Funtanas, Gary Wright and Tim Lime demonstrated the muscle of this new powerplant by hovering one Funtana while the other flew loops around it. After a minute of this, the plane did a vertical climb-out from the hover! Now keep in mind that we are talking about 12-pound planes! Each plane had a 6.7:1 gearbox running with a 30-cell, 3000mAh NiMH battery.

An electric-powered Funtana hovers for the crowd.

Ken Nogy's BVM Bandit in a low, wheels-down fly-by.

TOC director Steve Rojecki used a similar power setup (but a 5.2:1 gearbox) in his new FAI pattern class Acro 2 plane. This light, 10.5-pound composite plane tore into the sky, flipping and turning a number of aerobatic maneuvers with more than ample power.

The Hacker team also executed every stunt in the book with a Great Planes Venus 40 converted to electric power with a Hacker B-50 13S with a 6.7:1 gearbox and 16-cell, 3000mAh NiMH battery. The electric Venus zipped through the sky.

Ken final-checks his BVM Rafale jet before the performance.

Other demos included Ken Nogy and assistant David Shulman as they excited the audience with an all-out-power performance of Bob Violett Models' Bandit and Rafale jets. These jets incorporate the state-of-the-art Jet Cat turbines that are capable of almost unlimited flight performance. The awesome roar of the turbines turned every head as the jets streaked by.

The highlight of the demonstrations was the flying prowess of Allen Szabo Jr. This 16-year-old pilot performed stunts with his Raptor .60 helicopter that you had to see to believe. The helicopter carved up the sky in every conceivable direction and then hovered just inches above the ground, upside-down! Allen ended one flight by landing the Raptor upside-down on the rotors!

The TOC offers great flying from the world's best pilots, both in the competition and during the flight demonstrations. This double combination provided an outstanding event that every spectator enjoyed.

Allen Szabo Jr. hovers his inverted Raptor .60 helicopter just inches above the runway.

Assisted by his father, Allen Szabo Jr. begins his helicopter demonstration.

Quique Somenzini glides his Yak 54 through a low, knife-edge fly-by.

Quique Somenzini acknowledges the crowd after his outstanding free-style program.

top seven spots. At the end of the day, Christophe Paysant-Le Roux, Quique Somenzini, Chip Hyde, Jason Shulman, Mike McConville, Roland Matt and Sean McMurtry, respectively, had earned the right to compete for the $50,000 first-place prize. None of the semifinal-round scores would be carried over to the final rounds, but each pilot was guaranteed to win at least $6,500 for his efforts so far.

Sunday's final round started with clear skies and a slight breeze from the southwest. Each contestant had been given two known and two unknown sequences the night before and was allowed to fly them only once in front of the judges. The final unknown sequence no. 4 was so complicated that it required an isometric view of the first four maneuvers along with the Aresti symbols. The winner was decided from these four flights and two free-style flights.

AIR BALLET

Sensing the demands of these performances, the competitors flew the knowns and unknowns as smoothly and precisely as they could, while cutting loose on the 4-minute free-style flights with music, streamers, pyrotechnics and some extremely low flying that the crowd loved. During the free-style flights, the models were choreographed to move in harmony with the rhythm of the music while performing extreme maneuvers, and some of the contestants used special effects to catch the attention of the judges and the crowd.

All finalists used smoke during the 4-minute free-style flights. Roland Matt added red smoke canisters at the end of his wings to blaze three smoke trails through the sky. Not to be outdone,

Left: Christophe Paysant-Le Roux and his caller Benoit Paysant-La Roux "pre-fly" the unknown sequence with a small mock-up Extra 330. This is how most pilots gain orientation before they fly the unknown sequence. Right: each day starts with a pilots' meeting to discuss the day's events.

Jason Shulman and his caller Dan Wolanski watch his patriotically painted FiberClassics Extra 330 hover before doing a vertical climb-out.

We've come a long way, baby!

Here's a look back at our illustrious past and our coverage of the first International Tournament of Champions—our cover story for the March 1975 issue. Pictured is winner Hanno Prettner being congratulated by Miss Circus Circus, Chrissy DeFrancesco. Then Circus Circus Casino president Bill Bennett and the *Model Airplane News* publisher at the time, Walt Schroder, dreamed up the TOC format as a way to elevate the RC airplane hobby by gathering a group of internationally renowned pilots in Las Vegas to compete for prize money and the right to be called "best in the world."

The formula worked, and over the last four decades, the TOC has become one of the premier RC events. The airplanes have evolved quite a bit, but the concept has remained intact: draw the best pilots and the best planes together from around the world to see who is the best of the best! Now is that a groovy idea, or what!?

Christophe Paysant-Le Roux had confetti blowing out from under his plane and then two colored streamers extended from the wingtips. But what really im-pressed the crowd was Chip Hyde's torque roll just a foot above the ground while he walked around the plane the opposite way. He capped the performance by shooting his Ultimate biplane straight into the air, killing the engine and landing deadstick.

The day ended with trophies and prize money being distributed to all of the pilots. Roland Matt captured fourth. Flying a flawless unknown flight helped to earn third place for Quique Somenzini, while defending champion Christophe Paysant-Le Roux held on to second place. The number-one spot went to the only participant to fly a biplane and achieve perfect scores in both the known and unknown flights: Chip Hyde.

The TOC offers an opportunity to watch the best pilots in the world demonstrate what an RC plane is capable of doing. Don't miss this must-see event in 2004.

3W; *distributed by Desert Aircraft.*

Aeroworks *(303) 367-9792; aero-works.net.*

BVM *(407) 327-6333; bvmjets.com.*

Carden Aircraft *(828) 697-7177; carden-aircraft.com.*

Delro Modelltechnik; *delro.de.*

Desert Aircraft *(520) 722-0607; desertaircraft.com.*

FiberClassics; *distributed by Planes Plus (630) 904-5075; planesplus.com.*

Futaba Corp. of America; *distributed by Great Planes Model Distributors Co. (800) 682-8948; futaba-rc.com.*

Graupner; *distributed by Hobby Lobby Intl. (615) 373-1444; graupner.com.*

Great Planes Model Distributors Co. *(800) 682-8948; greatplanes.com.*

Hacker Brushless Motors *(480) 726-7519; hackerbrushless.com.*

JR; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

RadioCraft Industries Inc. *(480) 251-1094; trailblz@aol.com.*

Troy Built Models; *troybuiltmodels.com.*

ZN Line Kit; *distributed by Central Hobbies (800) 723-5937; centralhobbies.com; and Desert Aircraft.*

Lithium-polymer cells provide more performance and longer flight times for small RC airplanes

A NEW BREED

There has recently been quite a "buzz" in electric-model-airplane circles about the lightweight, high-capacity lithium-polymer batteries that have already proved to be a boon to the world of electric-powered flight—especially for smaller park and backyard flyers. Using these new cells, small RC planes can now fly for more than 30 minutes, as evidenced by the examples throughout this article. How can you take advantage of this wonderful new technology? Read on!

Lithium development

• **Lithium-metal cells.** About half a dozen years ago, lithium-metal batteries were introduced to the model aviation hobby. Manufactured by the Tadiran Co. for cell phones, camcorders and laptop computers, these batteries provided a considerable capacity in a relatively light package. The problem was that only one or two sizes were offered, and eventually, the cells were phased out of production.

• **Lithium-ion cells.** Introduced fairly recently, lithium-ion cells have become the power source of choice for the cell-phone industry. These cells offer an even better capacity-to-weight ratio than lithium-metal cells, but charging them can be tricky: if you don't charge them as specified, you can easily ruin them. Because these cylindrical cells contain a liquid electrolyte, they are also under pressure, and if mishandled, they could explode. Because of this, many lithium-ion cells have built-in high- and low-voltage circuit protection.

• **Lithium-polymer cells.** The new lithium-polymer (li-poly) cells have all the advantages of the lithium-ion cells, but their construction and chemical composition make them much safer to handle. They must still be charged and discharged carefully, however, or you could quickly degrade their performance.

Unlike lithium-ion cells, li-poly cells don't contain a liquid electrolyte; instead, they contain a gel-like polymer that's in a silver Mylar pouch. Because there is little pressure involved, li-polys have proven to be much safer. At worst, they'll swell up a little, but they won't explode. The cells' output connections are foil-like tabs to which a nichrome material has been welded so that you can solder connectors to the tabs more easily.

PHOTOS BY WALTER SIDAS

OF BATTERY

by Bob Aberle

All of the li-poly cells photographed for this article are from Kokam and are distributed exclusively in North America by FMA Direct.

TECH TALK

by Gordon Johnson

A Ni-Cd cell has a nominal voltage of 1.2, a NiMH, about 1.1 and a li-poly, 3.7. The li-poly cell's higher energy density makes a single li-poly cell roughly equivalent to a 3-cell Ni-Cd or NiMH pack (see "Weight and Capacity of Cell Types" chart).

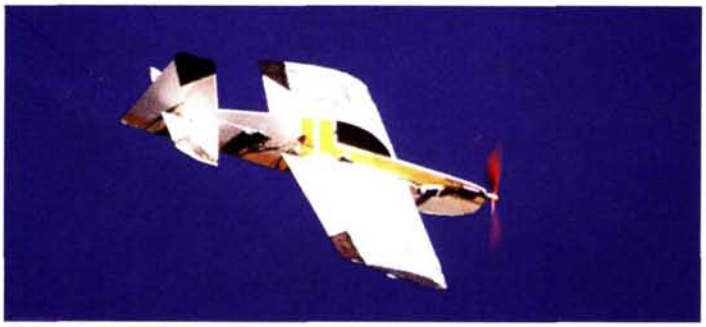
Although the results of static tests should be taken with a grain of salt because during such tests, the prop is not unloaded as it would be if the plane were moving through the air, they can be used to compare the thrust, amps and voltage provided by battery sources for a given motor/gear/prop combination. These tests are for full power with a loaded prop; actual amp draw will be less in flight (basically, the tests indicate a worst-case scenario for a battery pack!). I used FMA Kokam li-poly cells for these tests.

The two "Static Thrust" graphs show grams of thrust for LV and HV M20 motors over time, using these three battery sources, with current going straight from the battery to the motor. The graphs show that at full throttle, the li-poly cell excels in thrust and run time. The graphs also show that the motors differ: the LV motor, which has windings with lower resistance, generates more static thrust than the HV motor.

People sometimes prefer Ni-Cds to NiMHs for certain applications because Ni-Cds provide slightly more thrust in the first few minutes of a motor run. The M20-LV test graph shows that the Ni-Cds do, in fact, generate more static thrust than the NiMHs for the first few minutes, but the li-poly cell generates more static thrust than the Ni-Cds from the beginning, and it maintains that advantage throughout the motor run. In contrast, in the test of the M20-HV, the Kokam li-poly generated about the same static thrust as the Ni-Cds at the start but then very quickly surpassed it—although not by as much. This indicates that, for higher-amp-draw applications, the li-poly will be able to provide more thrust than a Ni-Cd or NiMH. For example, after powering the M20-LV for 2 minutes, the li-poly cell generates 18 percent more static thrust and puts out 25 percent more amps than the Ni-Cd pack. For very light indoor planes, this means that aerobatic performance is now possible using the M20-LV motor.

Weight & capacity of cell types

Cell/pack	Capacity	Voltage	Weight (w/wires)
1 li-poly	145mAh	3.7	4.1g
3-cell Ni-Cd	50mAh	3.6	11.7g
3-cell NiMH	120mAh	3.3	11.7g



Dave Thacker of Radical RC powers his 10-ounce Edge-540 model with a Hacker B-20 geared brushless motor and 4, 1940mAh li-poly cells (two each in series and then in parallel). The combined weight of these cells is only 3 ounces and the motor current is 7.3 amps. Dave has 16-minute flights, maintaining full vertical climb capability throughout that time.

Charging li-poly cells

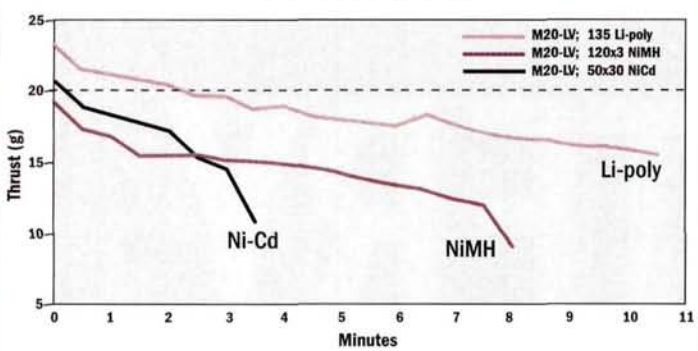
To start, *never* use a peak charger that's designed for use with Ni-Cd and NiMH cells on any lithium (ion or poly!) pack. Because lithium-ion and lithium-polymer cells have identical electrical characteristics, they can be charged using the same charger, so if your charger says "ion" or "polymer," you can use it with both types without a problem. A few new chargers on the market can handle all types of battery cell, but you must always remember to select the correct mode for a particular cell, or you will quickly ruin your battery (see "Where can I buy them" sidebar).

This Maha charger works with Ni-Cd, NiMH and li-poly cells; it's available from FMA Direct.

The recommended charge-current rate for lithium-polymer cells is 1 times its capacity in mAh; at that rate, a fully depleted cell should reach full charge in about an hour. As the cell voltage increases, so must the charge voltage to force current through the cell until the voltage applied reaches a maximum of 4.235 volts. As the cell voltages rises to that level, the current approaches zero. When the charge current falls to 1/10 the battery's capacity, the cell is fully charged.

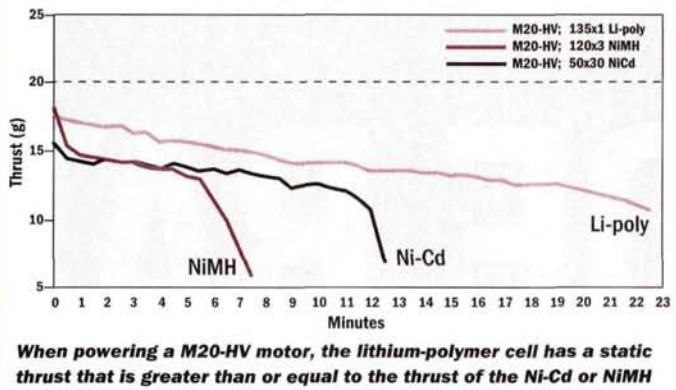
click trip MODELAIRPLANENEWS.COM FOR MORE ARTICLES ON LI-POLY CELLS.

M20-LV MOTOR THRUST RESULTS
6:1 gearing, GWS 5x3.0 prop



The static thrust from the lithium-polymer cell is greater than from either the Ni-Cd or the NiMH pack, and duration is significantly longer.

M20-HV MOTOR THRUST RESULTS
6:1 gearing, GWS 5x3.0 prop



When powering a M20-HV motor, the lithium-polymer cell has a static thrust that is greater than or equal to the thrust of the Ni-Cd or NiMH cell. Although the thrust from the M20-HV is lower than that of the M20-LV, run times are significantly longer.

The author's own-design 3.4-ounce Kiwi model is powered by a geared DC-5-2.4 coreless motor and 2 FMA/Kokam 145mAh li-poly cells. These 2 cells weigh only 0.3 ounce, yet they replace 6 NiMH cells of roughly comparable capacity that weigh approximately four times as much. With this power system, Bob easily obtains 8- to 10-minute flights on a charge.

Pro's and cons of li-poly power

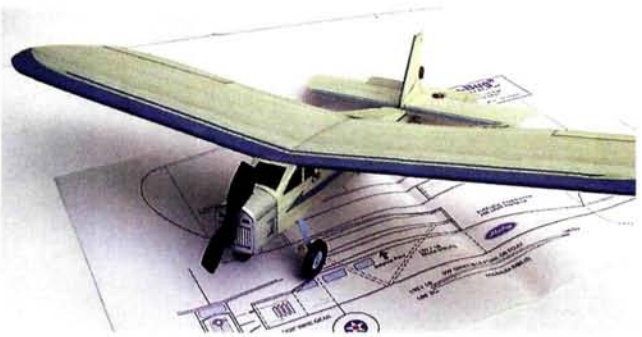
The major advantage of a li-poly cell is that it's ⅕ the weight of a Ni-Cd or NiMH cell of comparable capacity. Its disadvantage is that the recommended load for a li-poly cell can be as little as twice the battery's capacity in mAh, or as much as five times its capacity, but Ni-Cd and NiMH cells can easily sustain a current draw of 10 to 15 times their capacity. At this time, li-poly technology will allow loads of up to only about 12 amps, which is in the ballpark for a Speed 400 motor's requirements.

Some modelers have successfully wired sets of li-poly cells in series and then connected them in parallel to double, or even triple, their capacity. But if you do that, you'll add weight, make charging considerably more complex and will certainly increase your cost.

Another consideration is that you shouldn't discharge the li-poly cells below the recommended 3 volts per cell. The best way to guarantee that this doesn't happen is to use an electronic speed control (ESC) that has a programmable voltage cutoff. I use a Castle Creations Pixie-7P ESC that I can program to one of four voltage cutoffs (6 volts when I use 2 li-poly cells). In lieu of any automatic cutoff, you'll need to time your flights so that you land before the cells reach that minimum voltage. If you go below 2.5 volts per cell, your li-polys will never be the same again; consider yourself warned!

For more information about li-poly cells, chargers and small RC models, check out *RC MicroFlight* at rcmicroflight.com or see some previously published *RC MicroFlight* articles at our Click Trip.

The KP-00 motor in Matt Keenon's Bristol is geared at 3:1 and runs on a 190mAh lithium-polymer cell. The mainly foam model weighs just 0.70 ounce and can fly within a 20-foot radius for a reported 38 minutes.



On this, the second version of Don Srull's Blu Bug, a Kokam 3.6-gram, 145mAh litium-ion polymer cell took the place of the model's original 11-gram, 3-cell 120mAh NiMH battery. In addition to the more than 15 percent drop in the plane's weight, power and endurance increased. The model now weighs 15 grams, and Don reports backyard flights of up to 15 minutes.

Where can I buy them?

There are several manufacturers and distributors of li-poly cells right now, and I'm sure that more brands will soon be available.

- **Bob Selman Designs** has a 140mAh cells for $8 each and offers a basic charger that can charge a single, 145mAh li-poly cell at a 140mA rate; it costs $25.

- **FMA Direct** distributes Kokam li-poly cells in the U.S. They are available in 15 capacity ratings, from 45 up to 3270mAh. Prices range from $4.95 for the 45mAh cell up to $27.50 for the 3270mAh cell. The 45mAh cell weighs 0.06 ounce while the 3270mAh cell weighs 2.3 ounces without cables or connectors. FMA also distributes the Maha MH-C777 Plus--a universal charger for Ni-Cd, NiMH and lithium cells that costs $99.95.

- **Great Planes** offers a Triton universal charger that works with li-poly, Ni-Cd and NiMH cells. It will work with up to 4 li-poly cells wired in series, and it costs $130.

- **Plantraco** sells li-poly cells in three sizes: 145, 560 and 880mAh. They come with wires and an attached micro connector plug that mates with Plantraco's li-poly charger. The charger costs around $60, can charge up to 3 cells in series and has up to four charge rates (from 100 to 800mAh) to charge cells rated at from 45 to 3000+mAh.

- **Sky Hooks & Rigging** offers a li-poly charger for $50 that works with 1, 2, or 3 cells at 100 to 1000mAh.

- **Wild R/C** offers 950mAh, 1.5-ounce 2-cell and 2.2-ounce 3-cell li-poly packs for $35 and $45, respectively. It also carries four dedicated li-poly chargers: one for 2-cell packs; another for 1 or 2 cells; one for 1, 2, or 3 cells; and another for four, 2-cell packs. They cost between $24 and $75. Wild R/C also imports the Orbit Microlader universal charger; this costs $180 and will work with Ni-Cd, NiMH and all types of lithium cells.

Bob Selman Designs *(417) 358-9521; http://users.joplin.com/~bselman.*

Castle Creations *(913) 438-6325; castlecreations.com.*

FMA Direct *(800) 343-2934, (301) 831-8985; fmadirect.com.*

Great Planes Model Mfg. *(800) 682-8948; greatplanes.com.*

Plantraco; *plantraco.com.*

Radical RC *(937) 237-7889; radicalrc.com.*

Sky Hooks & Rigging *(905) 257-2101; microrc.com.*

Wild R/C Inc.; *wildrc.com.*

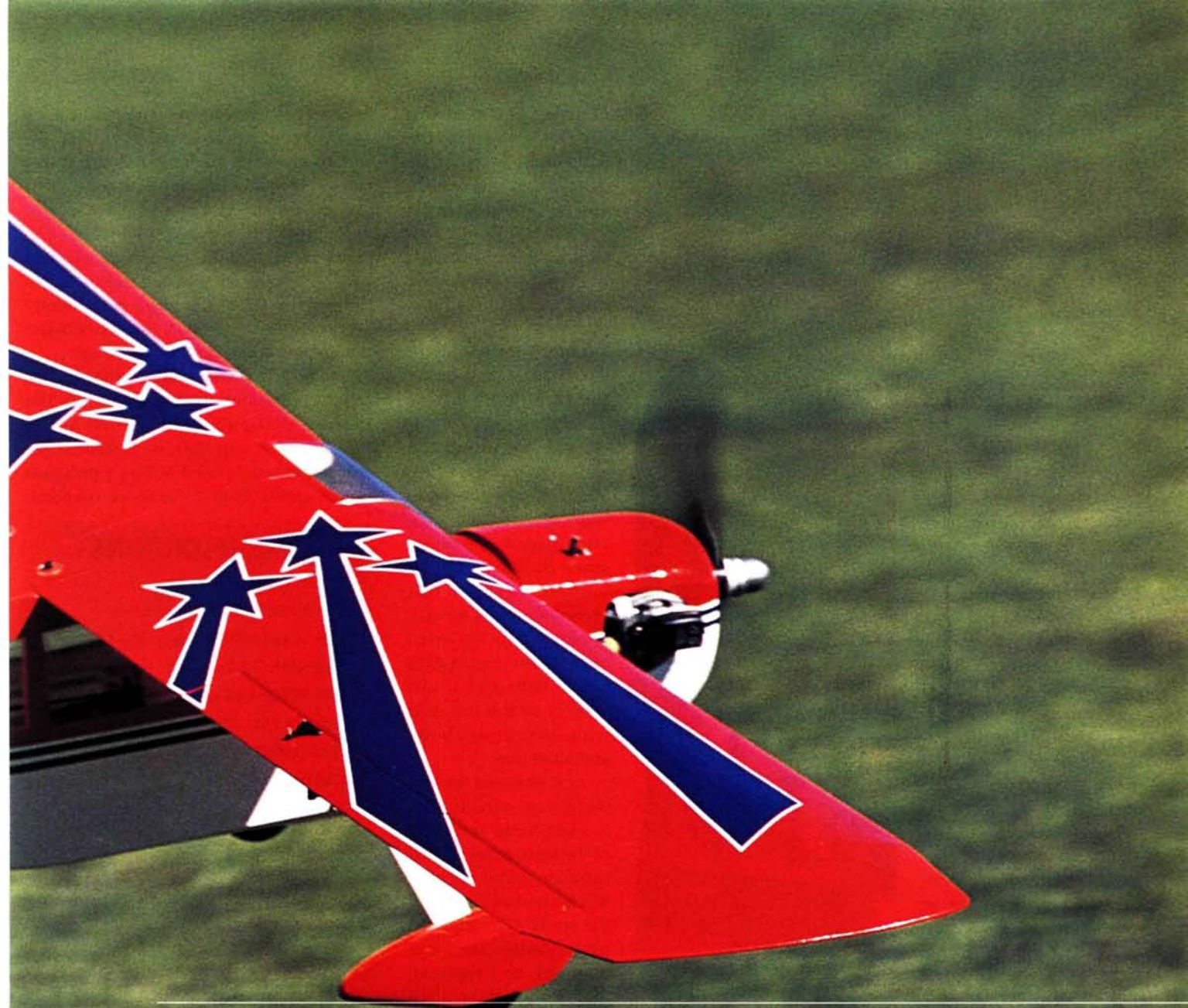
Lanier RC Citabria

Sport-scale aerobatic ARF

by Roger Post Sr.

As a classic-aircraft buff, I've always enjoyed the look of the Aeronca Model 7AC Champion and the various Model 7 airframes that have been developed from it through the years. The Champion Bellanca Citabria Standard—a beefed-up aerobatic version of the Model 7ECA airframe—has always particularly enticed me. Now, my favorite aerobatic airplane comes in an almost-ready-to-fly, .40 version from Lanier RC.

The Lanier Citabria is a nice-looking, stand-off-scale model, and its overall quality is as great as its looks. Constructed mainly of balsa, the Citabria comes almost completely built and covered and with most of what you need to get it into the air. Simply add a 4-channel radio, a powerplant and a few incidentals, and the Citabria is ready for some high-flying fun.



FLIGHT PERFORMANCE

After I double-checked the balance point and made sure that the control surfaces were moving in the proper direction, I fired up the O.S. .52 and tuned it for flight. The Citabria taxis easily on a smooth field with short grass. On rough fields or in tall grass, it's best to remove the wheel pants.

TAKEOFF AND LANDING

The Citabria has very docile takeoff and landing characteristics. The O.S. .52 has more than enough power to pull the plane into the sky. After about a 50-foot ground roll, gently pull the stick back to rotate the model. Slight right rudder is required to keep the track straight. As is typical with most tail-draggers, the tail lifts up during the takeoff roll.

To land the Citabria, set up the standard downwind base leg to final pattern while gradually reducing the throttle. I had to keep adding up-trim with each power reduction to maintain a comfortable glide-slope angle. When the model settles onto the final approach, bring the throttle to idle, and flare it a few inches above the runway. This aerobatic aircraft lands like a trainer.

LOW-SPEED PERFORMANCE

The Citabria performs extremely well at low speeds. As you bring the power back, add in some up-trim. When the model achieves the desired speed (it will have a positive angle of attack at this point), you can fly it around until the fuel runs out. The controls maintain authority right up and through the low-speed stall. I've also noticed that the left wing tends to drop slightly at the onset of the stall.

HIGH-SPEED PERFORMANCE

Although it is out of character for this type of plane, the Citabria can move through the air quite quickly with the throttle set to full speed. A high-speed stall is nonexistent because the model just keeps climbing. The controls are very responsive at high speeds; you might even want to tone them down with dual rates.

AEROBATICS

This is where the Citabria excels. It will roll, spin and loop with great precision. By adding ailerons as the model enters a spin, the spin becomes incredibly tight with a quick rotation. When you release the sticks, it takes about ¼ turn before the spin stops. With slight down-elevator, the Citabria easily performs inverted flight. As does its full-size counterpart, the Citabria's rudder needs to be coordinated with its ailerons to enter and come out of turns.

The generous rudder area and its amount of deflection allow the Citabria to snap rapidly—both inside and outside. The large rudder area also allows the Citabria to perform beautiful knife-edge runs across the sky. A little up-elevator and opposite aileron keep the model in true knife-edge flight.

The Citabria comes with everything you see here. The high-quality materials and low parts count make assembly a breeze.

ASSEMBLY

First, read the manual entirely and become familiar with the various parts of your model.

Wing. Begin with the wing. Following the instructions, I started by joining the wing halves. Because the recommended 5-minute epoxy sets quickly, make sure that the panels are perfectly aligned when you join them. Then install the ⅛-inch plywood wing-bolt doubler, and drill the bolt holes.

The ailerons come hinged, but they must be secured with CA. To complete the wing, install the aileron servos and control horns and then attach the aileron pushrods. You'll install the four wing-strut attachments later.

There is plenty of room for all of the radio gear in the Citabria's fuselage. Because I usually fly from a rough field, I decided to beef up the landing-gear block's support by adding ½-inch triangular balsa stock to the inside of the radio compartment, directly over each area where the landing-gear block is joined to the fuselage side.

Fuselage. Assembly of the fuselage starts with the engine installation. Attach the engine to the supplied mount as described in the manual, and be sure to leave 4⅛ inches between the firewall and the spinner's backplate. Then just mark and drill the holes for the throttle guide (a Dremel tool comes in handy here), and install the throttle linkage as directed.

Next, I mounted the wing-strut brackets where appropriate on the fuselage, attached the wing and placed the wing struts on their fuselage brackets. To ensure that everything could be easily replaced in the event of breakage, I used 8-32 plastic bolts and T-nuts instead of the supplied wing-mounting bolts and blind nuts.

I next mounted the four wing-strut-attachment brackets to the underside of the wing at the marked locations, added the plastic clevises and connected the struts. (The supplied plastic clevises later broke in flight, so I replaced them with stronger, metal clevises.) The clevises' lengths can be adjusted as needed to ensure that the struts don't pull or twist the wing when they're attached.

Tailpieces. Following the manual, I attached the horizontal stabilizer next. (Be sure to check its alignment as the epoxy cures.) I then attached the vertical stabilizer, making sure that it remained at a 90-degree angle to the horizontal stabilizer as the epoxy cured. Like the ailerons, the elevator and rudder come hinged and require only a few drops of CA to glue them permanently into place. Be sure to keep the gap between the surfaces' edges as small as you can.

The next step was to attach the elevator control horns and install the pushrod. The rudder's pull/pull cable, as well as the throttle cable, can then be installed. For added strength, I used Sullivan pull/pull rudder cables in place of those supplied.

SPECIFICATIONS

MODEL: Citabria .40

MANUFACTURER: Lanier RC Inc.

TYPE: stand-off scale aerobatic ARF

WINGSPAN: 64 in.

WING AREA: 625 sq. in.

WEIGHT: 5 lb., 13 oz.

WING LOADING: 21.43 oz./sq. ft.

LENGTH: 44.5 in.

ENGINE REQ'D: .40 to .50 2-stroke or .48 to .70 4-stroke

ENGINE USED: O.S. Max .52 FS 4-stroke

RADIO REQ'D: 4 channel w/5 servos (elevator, rudder, throttle and 2 ailerons)

RADIO USED: JR 783 w/5 JR servos

PROP USED: Master Airscrew 11x6

FUEL USED: Red Max 15% nitro

PRICE: $189.99

FEATURES: balsa construction; comes almost completely built and covered; package includes painted fiberglass cowl and wheel pants, a vacuum-formed clear canopy and side windows, formed aluminum landing gear, finished wing struts, easy-to-follow instructions with photos and all the necessary hardware and decals.

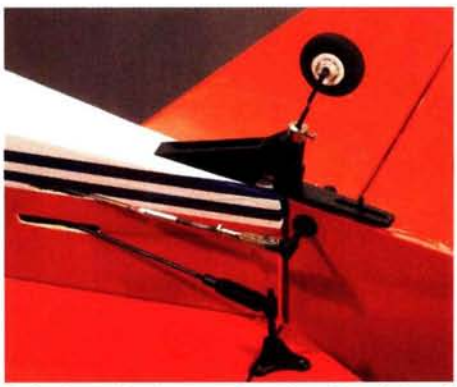
COMMENTS: the Citabria is fairly easy to assemble and requires only about three days to complete. At the field, it's a great flyer and is capable of almost any aerobatic maneuver.

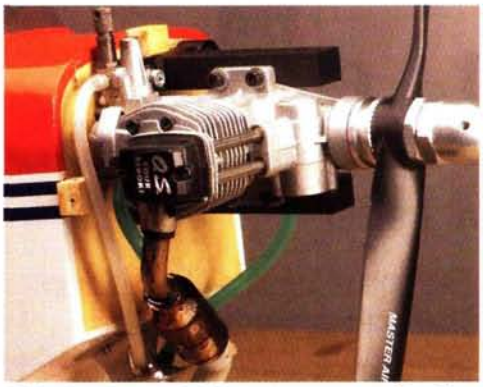
HITS

- Great flyer.
- Solid construction design.
- Nice appearance.
- Easy to assemble.

MISSES

- Decals do not stick well.
- Weak wing-strut attachment.





Left: the rudder's control arm is a threaded rod held in place by two locking nuts—one per side. The rudder uses a pull/pull system, and the elevator has a Y-shape pushrod that connects it to the servo. Right: the O.S. Max .52 FS provides plenty of power in the air and fits very nicely on the supplied mount. I used a Du-Bro Kwik-Fill Fueling Valve in place of one of the fuel lines. Note the position of its receptacle at the base of the firewall; this allows for easy access through the cowl's exhaust cutouts.

You can also add the tailwheel at this time.

Before I installed the landing gear, I painted it white to match the Citabria's covering. Because I fly off a fairly rough field, I added two pieces of ½-inch triangular balsa stock inside the radio compartment where the landing-gear block is attached to the sides of the fuselage. This helps ensure that the gear block will remain in place. Next, I attached the wheels and wheel pants to the aluminum gear and then secured the gear in place with 4-40 bolts and blind nuts (instead of the supplied wood screws). Last, I added the filler block.

The next step was to install the fuel tank. I used Du-Bro's Kwik-Fill Fueling Valve to eliminate one of the fuel lines and placed its receptacle on the bottom of the firewall; it can be accessed through the cowl's exhaust cutout. When the radio-system installation is complete, a check of the control surfaces' movement and amount of deflection is in order.

To finish the Citabria, I added the windshield and windows, cut out the holes in the cowl, attached the cowl and applied the decals. The decals did not adhere well to the covering, so I used clear tape in a few spots to keep their edges in place.

When assembly was complete, I made sure the model was balanced (the center of gravity is 3¼ inches back from the leading edge), checked its lateral balance, double-checked the control movements, performed a range check on the radio and test-ran and tuned the engine.

CONCLUSION

The Citabria's assembly was fairly easy; even novice builders will be able to put it together. It's also a great-flying model that can be flown by pilots of just about any experience level. The best part is that it lands like a trainer. Lanier RC has a winner here!

Du-Bro Products *(800) 848-9411; dubro.com.*

JR; *distributed by Horizon Hobby Inc. (217) 355-9511; horizonhobby.com.*

Lanier RC *(770) 532-6401; lanierrc.com.*

Master Airscrew; *distributed by Windsor Propeller Co. (916) 631-8385; masterairscrew.com.*

O.S.; *distributed by Great Planes Model Distributors Co. (800) 682-8948; osengines.com.*

Red Max; *a division of FHS Supply Inc. (800) 742-8484; members.aol.com/FHSoil/RedMax.html.*

Sullivan Products *(410) 732-3500; sullivanproducts.com.*

Super Kraft Laser 2000 ARF

Easy-build unlimited aerobat

by Jim Onorato

Inspired by the award-winning, full-size Laser 200, the radio-controlled Laser 2000 was designed specifically for competition aerobatics and has since spent its fair share of time in the winner's circle. Super Kraft's almost-ready-to-fly version of that giant-scale aerobat incorporates the same special design features and great flight characteristics as those that established the original Laser 2000 as a full-bred competitor.

The Laser 2000 is a very complete kit; you need only provide the engine, radio, prop and fuel tubing to get it into the air. From the moment you open the box, the excellent quality of its parts is readily apparent.

SPECIFICATIONS

MODEL: Laser 2000 ARF

MANUFACTURER: Super Kraft

DISTRIBUTOR: Kangke Industrial USA Inc.

TYPE: unlimited aerobatic ARF

WINGSPAN: 87 in.

WING AREA: 1,204 sq. in.

WEIGHT: 16 lb., 2 oz.

WING LOADING: 30.9 oz./sq. ft.

LENGTH: 70 in.

RADIO REQ'D: 4-channel with 6 servos (two elevator, two aileron, rudder and throttle; 7 servos w/remote kill switch)

RADIO USED: Futaba FP-T7UAP PCM transmitter, a FP-R129DP PCM receiver and 7 servos

ENGINE REQ'D: 2.4 to 3.2ci gasoline

ENGINE USED: Brison Aircraft 2.4 gasoline with a Slimline giant-scale Pitts-style muffler

FUEL USED: 80:1 gasoline/Klotz oil mixture

PROP USED 20x10 APC

STREET PRICE: $497.77

FEATURES: all balsa and lite-ply built-up construction covered in red, white, blue and yellow film; plug-in wing panels and removable tail feathers with functional flying wires; package includes painted fiberglass cowl and wheel pants, hefty aluminum landing gear, wheels, a fuel tank, canopy and complete hardware.

COMMENTS: this is a fine-looking airplane that's built the way you would build it (or maybe even better). Whether used in competition or just for Sunday fun, the Laser 2000's high-quality materials and expert workmanship will make it a hit at any flying site. This is a great flying machine.

HITS

- Excellent flight performance and low-speed stability.
- High-quality materials and workmanship.
- Complete hardware package.

MISSES

- None.

WHAT'S IN THE BOX?

This is a very complete kit. All you'll need to complete the Laser is an engine, a radio, a prop, fuel tubing, adhesive and a few basic tools. It features a built-up, balsa and lite-ply construction and is covered with red, white, blue and yellow film. It has plug-in wing panels and removable tail feathers with functional flying wires. The package also includes a painted fiberglass cowl and wheel pants, hefty aluminum landing gear, wheels, a fuel tank, canopy, spinner and a complete hardware package. The 12-page instruction manual includes step-by-step, photo-illustrated instructions to guide you through assembly.

The quality of the kit was readily apparent the moment I looked inside the fuselage. It has lite-ply formers and some balsa sheeting, but it's made mostly of ¼-inch-square stringers. Most impressive was the diagonal bracing in every bay and the fiberglass gussets that strengthen almost all the stringer joints.

Because the tail feathers are removable, the stabilizer and fin require the additional support provided by the rigging wires; they help strengthen the entire assembly.

ASSEMBLY

Normally, the first step in the assembly of an ARF is to remove the wrinkles from the covering, but to my surprise, the Laser had very few wrinkles. The competition airframe's unusual features require the Laser to be built in a particular manner, so it's a good idea to follow the instructions exactly. Except for the engine installation, I did just that.

Because the tail feathers are removable, the tail-rigging wires are necessary to help support the entire tail structure. The predrilled holes in the fin and stab for the wire-attachment brackets are small and somewhat difficult to find, but the instructions provide the necessary measurements to locate them. I opened the holes with a pin and then temporarily bolted the stab to the fuselage so that I could align the removable fin. To avoid accidentally gluing the fin to the stab, I placed a piece of wax paper under the fin-support block while I glued the fin to it. Next, I bent all the attachment brackets to shape and attached them to the fin and stab with the provided nuts and bolts. I installed the wire-attachment bracket to the underside of the fuselage where indicated and attached four wires from the bracket to the bottom of the stab. Be sure not to overtighten the wires; this could distort the stab. I fastened both the upper and lower rigging wires to the brackets with threaded metal clevises. The wires must be tightened enough to prevent any endplay but not so tightly that the fin and stab become distorted.

Next, I installed the landing gear and the tailwheel bracket; this allowed the fuselage to stand on its gear and made it easier for me to work on the model. This also created enough clearance for me to attach the cowl. I then assembled the fuel tank and placed it on top of the two support rails in

The first flights took place on a beautiful sunny day with a moderate breeze blowing diagonally across the runway. I set up my transmitter so that high rate would produce the control-surface throws recommended in the instructions, and low rate would be 70 percent of those values. I used the low rate for the initial flights. After performing a range check on my radio with the engine at full throttle, I topped off the tank and fired up the Brison for the initial flight.

TAKEOFF AND LANDING

I slowly advance the throttle while holding a bit of up-elevator. The Laser tracks straight ahead without rudder input, and at about ½ throttle, the plane lifts smoothly into the air; the tail never comes up during the takeoff roll. Just a few clicks of down-elevator and left aileron trim are all it needs for straight and level, hands-off flight.

Landing the Laser is fairly easy, but keep in mind that it has a shallow glide slope and does not lose speed quickly. I gradually cut the throttle while on base leg and continue to reduce it to idle on final. By using a long approach and some up-elevator to help bleed off speed, I usually get the Laser to settle in for beautiful 3-point landings and smooth rollouts.

SLOW-SPEED PERFORMANCE

The Laser is smooth and predictable at slow speed. To test the stall, I take it to a safe altitude and reduce the throttle while I apply more up-elevator. The stall is gentle and straight ahead. The plane can be flown at a very slow speed without losing stability, and it can execute all but vertical maneuvers at part throttle.

HIGH-SPEED PERFORMANCE

The Laser flies pretty fast and tracks extremely well at full throttle. I found it to be a smooth and stable flyer at all speeds, with no bad habits. But as with all large planes, prudent throttle management is highly recommended. This is a competitive aerobatic airplane—not a racer!

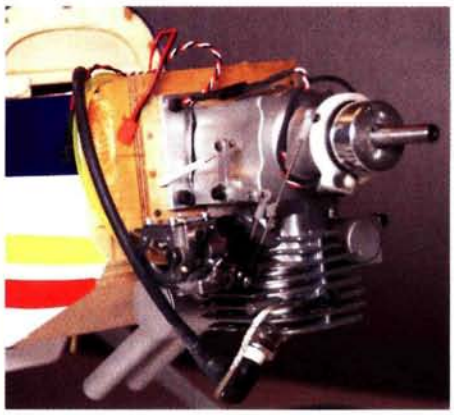
AEROBATICS

Aerobatics are the Laser's forte. It is a proven aerobat, capable of every imaginable maneuver. I expected it to perform well, and I was not disappointed. Inside and outside snap rolls, sustained knife-edge and outside 360-degree turns are no problem for the Laser. Axial rolls are fast and truly axial. Spin recovery was within ¼ spin when the controls are released, and the Laser requires only slight down-elevator to maintain level inverted flight. I have not yet attempted any 3D maneuvers, but I have no doubt that with the proper control setup, the Laser would have no trouble executing them.

The Brison Aircraft 2.4 proved to be powerful enough for unlimited vertical performance. Overall, I was very pleased with the performance of both the plane and the engine. This is a smooth-flying model!

the fuselage body. A Popsicle stick laid across the top of the tank and glued to the side of the fuselage at both ends holds the fuel tank in place. I had to cut the bottom of the canopy frame to provide enough clearance for the tank. I used a three-line fuel system with Slimline fueling fittings on the fill line.

The included control horns and pushrods are different from any I've ever seen. The control horns consist of machined posts with male threads at one end and female threads at the other. Made of red-anodized aluminum, the control horns are attached to the control surfaces with backing rings and socket-head capscrews. Small, nylon horn brackets, to which the pushrods are attached, are threaded onto the other end. The elevator and aileron pushrods are precut, 3/16-inch, blue-anodized aluminum with 3mm steel studs, locking nuts and clevises at each end. Following the instructions, I drilled 1/8-inch holes in the control surfaces and installed all the control horns.



Above: the Brison engine proved to be a perfect match for the Laser 2000. It can be easily installed with the provided hardware, fits perfectly in the given space and produces more than enough power for unlimited vertical performance. Left: there's plenty of room in the Laser's fuselage for all of the necessary radio equipment, even with an additional servo for the kill switch. To prevent any radio interference, it's important to keep everything associated with the radio system as far away as possible from the ignition system.

I hinged the control surfaces with the CA-type hinges provided and then installed the servos and pushrods in the tail end. Super Kraft recommends that you use servos with at least 60 ounces of torque for the ailerons and elevator halves. I installed four Futaba S9202 coreless servos for the ailerons and elevator halves and a reversing Y-harness to connect the two elevator servos. Of course, if you have a computer radio, you can eliminate the Y-harness by connecting elevator servos to two different channels. The rudder is controlled by a pull/pull system that consists of two solid wire rods. The manual suggests that you use a servo capable of 100 ounces of torque for the rudder, so I installed a Futaba S9151 digital servo. I mounted it in the bottom of the fuselage, just in front of the rigging-wire bracket. I then installed the aileron servos on the underside of the aileron-servo covers and connected them to the aileron control horns with the provided pushrods.

Now I was ready to install the engine. Super Kraft recommends a 2.4 to 3.2ci gasoline engine for the Laser, so I chose a Brison Aircraft 2.4. I marked the centerlines for the engine on the firewall where indicated and then took the necessary measurements to determine what size spacer my engine required. The instructions indicate that the distance from the firewall to the back of the spinner should be 6 7/16 inches, but I recommend that you temporarily install the cowl and check this dimension. After assembling the spacer out of aircraft ply, I installed the engine with the hardware provided. Then, I temporarily installed the canopy deck, lined up the cowl and cut out clearance holes for the engine and muffler. I used a giant-scale Slimline muffler that fit nicely under the nose of the fuselage. The cowl has four metal mounting brackets that are fastened to the top and bottom of the fuselage with four sheet-metal screws.

I mounted a 4.8V, 1000mAh ignition battery between the spacer and the firewall. I then installed the ignition module on the inside of the fuselage just behind the firewall along with a servo-operated kill switch. (I also installed a manual kill switch in the cowl.) The throttle servo and kill-switch servo (Futaba S148s) were mounted in the fuselage behind the fuel tank and connected to the engine and kill switch with plastic pushrods. I mounted the receiver on the tray under the canopy and attached a 4.8V, 1800mAh receiver battery to a tray just in front of the wing tube. This arrangement kept everything associated with the radio as far away from the ignition system as possible to prevent radio interference.

Next, I replaced the included capscrew axles with 3/32-inch Du-Bro axles and installed the wheels and fiberglass wheel pants. Then I installed the tailwheel assembly.

The canopy frame extends from the turtle deck to the cowl and is removable for easy access to the interior of the fuselage. I added a balsa floor to the cockpit, painted it with black acrylic paint and installed a 1/4-scale civilian pilot figure. The clear canopy was attached with screws and trim tape.

FINAL TOUCHES

I decided to make a few changes to the trim scheme on my Laser. First, I removed the yellow trim from the front of the wing and replaced it with blue, and then I removed the blue trim from the ailerons and made them all yellow. I also removed the white from the rudder in favor of blue and chose not to apply all of the stars supplied.

Last, I fitted the Brison engine with a 20x10 APC prop and the included aluminum spinner.

CONCLUSION

Super Kraft's Laser 2000 is a superbly crafted airplane that is easy to assemble, is very aerobatic and has good low-speed stability. In addition, it looks great both on the ground and in the air. I really enjoyed building and flying this airplane, and I highly recommend it for advanced fliers.

APC Props; *distributed by Landing Products (530) 661-0399; apcprop.com.*

Brison Aircraft *(972) 241-9152; brisonaircraft.com.*

Du-Bro Products *(800) 848-9411; dubro.com.*

Futaba Corp. of America; *distributed by Great Planes Model Distributors Co. (800) 682-8948; futaba-rc.com.*

Slimline Mfg. *(480) 967-5053; slimlineproducts.com.*

Super Kraft; *distributed by Kangke Industrial USA Inc. (877) 203-2377; (631) 274-3058; kangkeusa.com.*

Hangar 9 ULTRA Stick .60

by John Kotleba

Ugly Sticks first gained popularity many years ago as easy-to-fly aerobatic models. Hangar 9 quickly took notice of its successful design and from it developed the popular Ultra Stick 1.20 and .40 models. These aerobats became so successful that Hangar 9 decided to add yet another to the Ultra Series product line—the almost-ready-to-fly (ARF) Ultra Stick .60. Like its predecessors, this new model can be configured to do wild and thrilling 3D aerobatic maneuvers.

PHOTOS BY JOHN KOTLEBA

Aerobatic sport flyer ARF

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

The plane tracks straight down the asphalt runway with very little rudder input. As it accelerates, the Ultra Stick gently lifts without any elevator input. With full flaps and rapid throttle advance, it leaps into the air.

Landing approaches are clean and short when flaps are employed. The crow function slows the plane down to a crawl and produces extremely short Harrier-type landings.

LOW-SPEED PERFORMANCE

Smooth level flight can be achieved with just three clicks of down-elevator on the trim tabs. The Ultra Stick is very stable and responsive at low speeds, even on low rates. Induced stalls are straight ahead with no tendency to drop either wingtip.

HIGH-SPEED PERFORMANCE

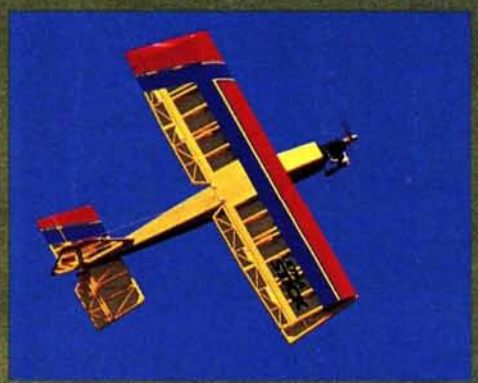
The Saito FA-100 supplies ample high-speed power. At full throttle, the vertical climb rate is very high. Because the Ultra Stick is capable of such high-speed flight, I generally fly it at ½ throttle. Flights are stable, and the plane tracks very well.

AEROBATICS

Set at 4⅛ inches from the leading edge, the CG is good for most aerobatic maneuvers. On low rates, axial rolls are moderate, and fairly large loops, both inside and out, are round and easy to perform.

When inverted, the Ultra Stick requires minimum elevator input to maintain level flight. While performing knife-edge flight, I use a little up-elevator to maintain straight and level flight.

When the radio is set at high rates, the rotation rates of spins and axial rolls are much faster, and snap rolls become very crisp and on command. Very tight loops can be achieved with full flaps, and the plane hovers easily.



Check out that spectacular red, blue and yellow color scheme. This is one aerobat you won't have trouble keeping your eye on.

WHAT'S IN THE BOX?

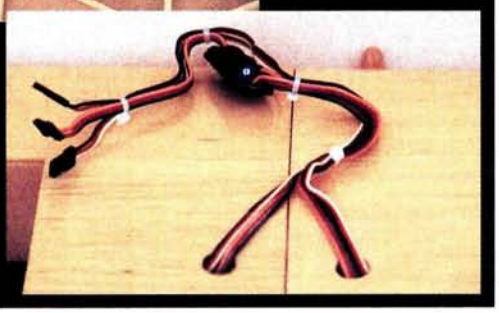
The kit includes all the major balsa and plywood sections assembled and covered in UltraCote. I was pleased with Hangar 9's superb application of the brightly colored blue, red and transparent yellow film; all of the seams were well overlapped, and the trim pieces/decals had been applied perfectly straight. I found very few wrinkles in the covering, and these were easily removed with the careful use of a heat gun and an iron.

The package includes the wings, fuselage and tail assemblies, all the required hardware, linkages, pushrods, main wheel and tailwheels, fixed landing gear, engine mount and a fuel tank. The Ultra Stick .60 comes both with strip ailerons to build a conventional wing and with a set of shorter ailerons and flaps to build a quad-flap version. Also enclosed is a very detailed 80-page, photo-illustrated instruction manual, the second half of which is dedicated to programming JR and Futaba computer radios. The only additional items needed to complete the plane are the radio equipment, foam padding, engine, propeller and spinner.

ASSEMBLY

To get the most enjoyment out of this model, I decided to build the quad-flap version. Doing so also allowed me to utilize the full potential of my computer radio. I assembled this plane by following the step-by-step instructions.

Each aileron and flap is actuated by its own assigned servo. To absorb some of the stress placed on the airframe by 3D maneuvers, I decided to use high-torque servos on all of the control surfaces, though this is not required by Hangar 9.



I used this servo-reversing Y-harness to reverse the travel of the left flap servo. This was necessary to achieve quad-flap functions.

Wings. Join the ailerons and flaps to the wing by applying thin CA to both sides of each hinge while making sure that you maintain a gap of 1/32 inch or less between the wing panels, ailerons and flaps. I used two T-pins for each hinge to ensure that the control-surface hinges would be

SPECIFICATIONS

MODEL: Ultra Stick .60

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby Inc.

TYPE: sport aerobatic ARF

WINGSPAN: 66 in.

LENGTH: 55 in.

WING AREA: 927 sq. in.

WEIGHT: 6 lb., 5 oz.

WING LOADING: 15.7 oz./sq. ft.

RADIO REQ'D: 4-channel w/5 servos (elevator, rudder, throttle, 2 ailerons); 6-channel computer radio w/7 servos (quad flaps)

RADIO USED: Airtronics Radiant 6-channel w/6 Hitec HS-605BB servos and one Airtronics 94102 servo

ENGINE REQ'D: .60 to .78 2-stroke or .72 to 1.00 4-stroke

ENGINE USED: Saito FA-100 4-stroke

PROP USED: Zinger 14x10

FUEL USED: Wildcat 15% nitro

PRICE: $179.99

FEATURES: balsa and ply construction; one-piece, all-wood wing, factory-covered in UltraCote; ailerons accept dual standard servos; kit includes all necessary hardware, linkages, pushrods, main wheel and tailwheels, fixed landing gear, engine mount, fuel tank and photo-illustrated instruction manual; can be built as conventional wing or quad-flap version.

COMMENTS: this plane can be assembled quickly and can easily be flown by any pilot who has successfully flown a trainer. The bright red and blue trim colors across the top of the wing help considerably with plane orientation—a nice touch for a model with such wild aerobatic capabilities. The quad-flap configuration ensures truly exciting flights.

HITS

- Exceptional flight performance.
- Excellent covering.
- Photo-illustrated manual.
- Easy to assemble.

MISSES

- No bend in tailwheel wire.
- Pushrod exit holes opposite of manual.

properly centered. I joined the wing halves with 30-minute epoxy and held the assembly in place for a few minutes. I then placed it on a large, level building board and allowed the epoxy to cure overnight.

Each aileron and flap is actuated by its own assigned servo. Though not required, to withstand stress placed on an airframe by 3D and aerobatic maneuvers, I installed high-torque servos for all the control surfaces. To help thread the servo-extension wires through each wing panel, I used a flexible nylon pushrod instead of the string-and-weight technique shown in the kit's manual.

To strengthen all of the linkages going to the control surfaces, I removed some of the covering from under the control-horn bases, pricked the exposed balsa with a T-pin several times, soaked the area with a few drops of thin CA and allowed the glue to dry thoroughly before I reassembled the control horns.

The Saito FA 1.00 supplies more than enough power for the Ultra Stick .60 to do all of the aerobatic maneuvers it was designed for.

Tail assembly. As illustrated in the instructions, the tail assembly is pretty straightforward. Your main concern should be to ensure that all of the surface areas align with each other.

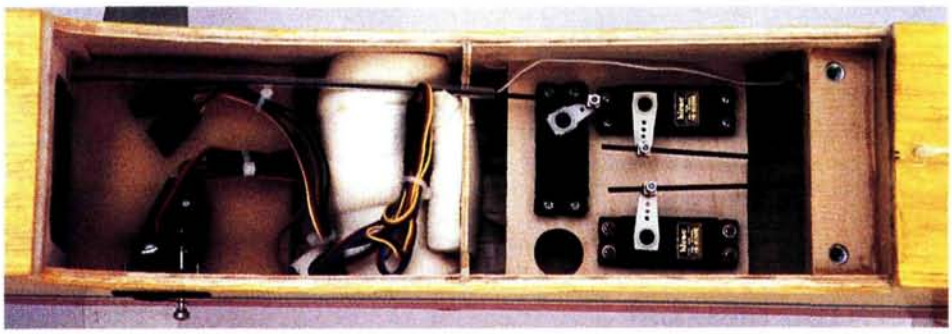
When I compared my tailwheel assembly with the one pictured in the manual, I noticed that mine lacked a bend in the wire at the bottom of the nylon bushing. I had to make a 40-degree bend in the wire before I could install the tailwheel assembly. Also, the pushrod exit holes are opposite to those shown in the instruction manual. I had to "mirror" their locations for the rudder and elevator control horns. Be sure to strengthen the mounting base of the control horns by using the same procedure as detailed for the ailerons and flaps.

The roomy fuselage accommodates all of the necessary radio equipment.

Engine installation. Because I wanted to install the largest 4-stroke engine recommended by the manufacturer, I decided to power my model with the new Saito FA-100. The holes necessary to install a side-mounted engine come already drilled in the Ultra Stick's firewall, so I mounted the engine with the cylinder head on the right of the fuselage. I drilled the engine-mounting holes in the mounting rails and marked the location on the firewall for the throttle pushrod. To achieve the proper clearance between the fuel tank and the throttle pushrod, I needed to rotate the engine carburetor assembly 180 degrees. I then removed the engine mount, fuelproofed the firewall with 30-minute epoxy thinned with alcohol, and allowed it to cure overnight.

Radio installation. I installed Hitec HS-605BB high-torque, standard-size servos to operate the control surfaces, and for quad-flap functions, I installed a servo-reversing Y-harness to reverse the travel of the left flap servo. I connected the Y-harness to the gear channel, connected the right aileron servo to the aileron channel and the other servo to the flap channel to activate crow function. I installed a 3-inch-long piece of fuel tubing through the top of the fuselage directly behind the trailing edge of the wing-mounting plate and routed the receiver antenna wire through this tube. I then attached the end of the wire to the top of the vertical stabilizer.

Fuel tank. After I had assembled the fuel tank, I pressure-tested it under water while



watching for air leaks. A few air bubbles exposed a leak in the center of the rubber stopper where the 3mm screw passes through it. Tightening the stopper screw solved the problem, but be careful not to overtighten it. I then wrapped ½-inch foam around the tank and installed it according to the manual. Be sure to route the throttle pushrod from the engine to the servo before you permanently install the tank. The tank's neck should protrude through the hole in the firewall and be secured with a generous daub of silicone sealant between the tank and the firewall.

FINAL TOUCHES

To increase the effectiveness of the controls, I sealed one side of each control-surface hinge gap with clear film. I balanced the model by placing the radio battery pack toward the rear of the fuselage, but I needed to add 1¼ ounces to the left wingtip to balance the plane laterally. I adjusted the travel for each control surface using the values listed in the manual, and since my transmitter allows dual rate only for the elevator and ailerons, I set the rudder to handle a 3¼-inch travel.

Before the first flight, I bench-ran the new Saito engine through four tanks of fuel with a 14x10 prop. Through the first tank, I ran the engine very rich and did not allow it to exceed 4,000rpm. I used the next three tanks to gradually lean the engine out. I then checked and adjusted the valve gaps before I installed the engine in the plane.

CONCLUSION

This is a quick-to-build ARF with outstanding flight characteristics. In my opinion, any flier who has successfully flown a trainer will definitely be able to handle this aircraft and learn to do precision and 3D aerobatic maneuvers. The quad-flap configuration allows exciting flights. I receive many compliments on this plane when it sits on display in the pit area between flights. I highly recommend the Ultra Stick .60 to anyone who wants to enter the realm of precision and 3D aerobatics and to those who are just looking for plain ol' fun. ✈

Airtronics *(714) 978-1895; airtronics.net.*

Hangar 9*; distributed by Horizon Hobby Inc.*

Hitec RCD Inc. *(800) 682-8948; hitecrcd.com.*

Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*

Saito*; distributed by Horizon Hobby Inc.*

Wildcat Fuels *(888) 815-7575; wildcatfuel.com.*

Zinger*; distributed by J&Z Products (310) 539-2313; zingerpropeller.com.*

A giant-scale ARF of a classic flight trainer

Great Planes PT-19

by John Reid

The Fairchild PT-19 introduced thousands of new pilots to the world of flight, and it has to be one of the most recognizable WW II trainer planes. The original PT-19 had two open cockpits—one for the student and one for the instructor—and it was powered by an in-line 6-cylinder, air-cooled Ranger engine that was mounted inverted. Now Great Planes brings us the PT-19 ARF, and like the full-scale plane, it is a great, giant-scale trainer.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

When everything checked out, I started the engine and pointed the PT-19 toward the runway. I advanced the throttle and applied a little up-elevator. The plane tracked straight down the runway with very little right rudder input. When I eased up on the elevator, the tail came right up, and the plane rolled just a bit farther and then jumped into the air much sooner than I had expected. I had to add about five clicks of down-trim to prevent the PT-19 from climbing too fast. On reaching the desired altitude, I leveled the plane off. Two more clicks of down-trim and three clicks of right aileron trim allowed the PT-19 to track straight.

This plane is one of the easiest I have ever landed. At ½ throttle, I needed slight up-trim to keep it flying level. Even at ¼ throttle, it needed very little up-elevator to maintain level flight. Neither wingtip dropped as the plane floated in for nice 3-point landings. The PT-19 is so solid in the air and on landing that I would not hesitate to use it as a trainer (maybe that's why the U.S. Army used the full-scale version for training pilots!).

LOW-SPEED PERFORMANCE

The PT-19 flies just fine at ½ throttle with a little up-trim to maintain level fight; all the controls are responsive. I was able to do rolls, and if I came out of a shallow dive, the plane would complete a full loop when I added up-elevator. Flying low passes at ½ throttle gave a realistic scale appearance. When I slowed the plane down and forced a stall, it did so mildly with a slight dip to the right.

HIGH-SPEED PERFORMANCE

With the O.S. 1.20 engine swinging a 16x6 prop at full throttle, this plane hauled right along. Though the engine doesn't pull the plane straight up out of sight, it does climb a respectable distance before it runs out of steam. Although at full throttle, the plane seemed a little fast for scale flight, and a low flyby followed by a pull-up into a victory roll really looked cool. I enjoyed the

performance of the O.S. 1.20 engine, and the plane would fly very well with any of the smaller recommended engines.

AEROBATICS

The PT-19 was nicknamed the "Cradle of Heroes" and was used by the Army to train pilots for the faster fighters of WW II. Even though it wasn't designed for full aerobatic performance, the Great Planes PT-19 will perform loops, rolls, spins and combinations of these maneuvers. Inverted flight requires quite a bit of down-elevator, and it can be a challenge to hold inverted for any length of time. Even with its large rudder, a knife-edge was hard to hold. When all is said and done, this plane will perform a wide array of aerobatics.

PHOTOS BY JOHN REID

REMOVING THE WRAPS

The Great Planes model is almost ready to fly when you open the box. All of the major parts are wrapped in plastic bags. The built-up all-balsa model is expertly covered in MonoKote, and the painted fiberglass cowl is nicely done. The kit also includes wire landing gear, main wheels and a tailwheel, a fuel tank, a rollover bar, an engine mount, vacuum-formed windscreens, two large sheets of decals and just about all the hardware needed to complete the kit. The instruction manual is typical of Great Planes: photo-illustrated and filled with helpful hints. You need only add an engine, a radio system and other miscellaneous odds and ends.

The included landing-gear fairings do a fine job of dressing up the wire legs. After they were mounted, I painted them to hide the seam.

ASSEMBLY

I built the PT-19 according to the instructions, starting with the wing. To better allow the thin CA glue to wick around the hinges, I drilled a 1/32-inch-diameter hole in all of the precut hinge slots and then hinged the ailerons. I cut the openings for the aileron servos, the servo leads and the wing-bolt holes. Great Planes has placed a length of string in the wing panels to pull the aileron servo leads through the wing. The instructions recommend a 12-inch servo extension, but I needed an 18-inch extension for the Airtronics servos that I used. The instructions show the aileron pushrods using an EZ connector; this should be used on the throttle. Use the provided Fastlinks on the servo arms and a clevis on the aileron horns.

The wing panels are joined with three plywood joiners. I used 6-minute epoxy to laminate the joiners, and when the epoxy had cured, I glued the wing halves together with 30-minute epoxy. Then I secured the Y-harness to the aileron servos with shrink tubing and attached the wing-bolt plate and wooden dowels to the wing's leading edge.

You can dress up the landing-gear wire by using the optional gear fairing. It's made of painted ABS plastic and nicely details the plain landing-gear wires. I glued the fairing halves over the gear wires and painted them with matching spray paint to cover the joint.

EMPENNAGE

The instructions explain in great detail how to align the stabilizer and fin to the fuselage. The stabilizer slides into slots on each side of the fuselage. I applied epoxy to the exposed balsa on the stabilizer and then slid it through the slot. Remove any excess epoxy with rubbing alcohol. I attached the fin to the fuselage with a generous amount of epoxy to lock the tail feathers in. Then I attached the elevators and rudder with the provided CA-type hinges and added the tailwheel assembly.

ENGINE INSTALLATION

Great Planes recommends an engine ranging from .61 to .91 2-stroke or .91 to 1.20 4-stroke and provides detailed instructions for installing both types. I felt that this large-scale plane needed the 4-stroke, and I used an O.S. FS 1.20 4-stroke engine. The kit includes a template for the engine-

SPECIFICATIONS

MODEL: PT-19

MANUFACTURER: Great Planes Model Mfg. Co.

TYPE: sport-scale ARF

LENGTH: 64.5 in.

WINGSPAN: 82.5 in.

WING AREA: 1,027 sq. in.

WEIGHT: 11 lb., 4 oz.

WING LOADING: 25.24 oz./sq. ft.

ENGINE REQ'D: .61 to .91 2-stroke or .91 to 1.20 4-stroke

ENGINE USED: O.S. FS 1.20 4-stroke

PROP USED: Master Airscrew 16x6

RADIO REQ'D: 4-channel w/5 standard servos (rudder, elevator, throttle and 2 ailerons)

RADIO USED: Airtronics RD6000 w/5 94102 servos

FUEL USED: Powermaster 15%

PRICE: $274.99

FEATURES: all-wood ARF comes covered with Top Flite MonoKote; painted fiberglass cowl; preformed landing gear; main wheels and tailwheel; fuel tank; adjustable engine mount; vacuum-formed windscreens; two large sheets of decals; photo-illustrated instruction manual; complete hardware package.

COMMENTS: the Great Planes PT-19 is a high-quality, easy-to-build ARF kit. It gets you into the air quickly, looks great in the air and has very good flight characteristics (as a military trainer should). I recommend this kit for those who are looking for a first giant-scale airplane and for the seasoned sport flier.

HITS

- High-quality construction and covering.
- Excellent construction manual.
- Generous hardware.
- Great flight performance.

MISSES

- Engine-mounting bolts are too short.

mounting holes; I marked their positions and drilled the holes for the blind nuts. When I tried to secure the engine mount with the provided 8-32x1-inch socket-head bolts, I found that they were too short, and I replaced them with 1½-inch-long bolts (1¼-inch-long bolts will also work). I drilled and tapped the engine mount and then mounted the engine inverted. I also added a remote plug igniter to make starting the engine easier.

Next, I assembled the fuel tank and installed it in the fuselage with the neck inserted through a hole in the firewall. The fuel-tank support inside the fuselage was a perfect fit and held the tank securely with a few beads of silicone sealant. To make it easier to fill the tank, I used a Du-Bro Kwik-Fill fueling valve.

The one-piece cowl is made of light, durable fiberglass and is expertly painted to match the fuselage. After I cut the required access holes in the cowl, I secured it to the fuselage with four self-tapping screws.

Above: the engine installation is typical, and the O.S. FS 1.20 4-stroke nestles nicely in front of the firewall. Note the Du-Bro Kwik-Fill valve. Right: it's easy to install the radio gear because there's plenty of room to work inside the fuselage. I added a plywood plate to hold the wing by the locating dowels.

FUSELAGE ASSEMBLY

The PT-19's spacious fuselage and the detailed step-by-step instructions make installing the radio gear and pushrods a snap. I used an Airtronics RD6000 radio with standard 94102 servos. I fitted the rudder and elevator servos in the plywood servo tray and drilled pilot holes for the servo-mounting screws. To prevent the screw holes from stripping, I added a few drops of thin CA and allowed it to harden before I mounted the servos.

Each elevator uses its own pushrod, and the pushrods are joined at the servo by fastening them together with two 5/32-inch wheel collars. I aligned the elevator halves, tightened the setscrews on the wheel collars and then epoxied the pushrods and wheel collars together. Being careful not to hit the fuel tank, I drilled a hole through the firewall for the throttle-pushrod guide tube and glued it into place. Then I installed the throttle servo on the left side of the servo tray instead of in the middle as shown in the instructions, and I connected the remaining pushrods. I wrapped the battery and receiver with foam rubber and installed them in the forward compartment. The receiver antenna is routed out through the bottom of the fuselage and held in place with clear tape. I placed a pilot figure in the rear cockpit and installed the receiver switch in the front cockpit.

FINAL ASSEMBLY

I painted the windscreen frames and added the rollover post between the cockpits. I glued in an optional ¼-inch plywood plate between the fuselage sides in the wing saddle. The plate has two holes that match the spacing of the dowels in the wing leading edge. When I assemble the wing to the fuselage at the field, I insert the dowels in the wing's leading edge into the plywood plate; this frees up my hands so I'm able to plug in the aileron servos or work on the inside of the fuselage.

The first time I tried to screw the wing to the fuselage, a wing bolt pushed out one of the blind nuts. I pushed it back into place and secured it with epoxy. I applied the decals (use the box art for their positions), checked the control-surface deflections, balanced the plane and was ready for the flying field.

HAPPY ENDINGS

The Great Planes PT-19 is a well-designed, high-quality, easy-to-build ARF that looks great on the ground. (It attracted quite a number of onlookers during my preflight check.) Add the sound of a 4-stroke engine under the cowl, and this plane looks and sounds fantastic in the air, too. The kit was such a pleasure to build, and the plane a pleasure to fly, that I can't wait to build my next ARF. If you are looking for a sport-scale kit that will get you into the air quickly and be fun to fly, the Great Planes PT-19 is a great choice. ✈

Airtronics *(714) 978-1895; airtronics.net.*

Du-Bro Products *(800) 848-9411; dubro.com.*

Great Planes Model Distributors Co. *(800) 682-8948; greatplanes.com.*

Master Airscrew; *distributed by Windsor Propeller Co. (916) 631-8385; masterairscrew.com.*

O.S.; *distributed by Great Planes; osengines.com.*

PowerMaster *(800) 847-9086; powermasterfuels.com.*

FLIGHT TEST

SIG MFG. Demoiselle

The world's first ultralight?

by Dave Robelen

I have been fascinated with the Demoiselle ever since I saw the movie "Those Magnificent Men In Their Flying Machines." When I watched the prototype of this Sig kit fly at Toledo in 2002, I added the model to my "must-build" list.

The Demoiselle prototype flew quite well with the GWS IPS "B" drive (7:1 gear ratio), so that is what I used with my kit, although I did substitute a slightly larger (11x4.7) prop. Sig recommends the "D" drive (9.66:1 ratio), and I think the additional thrust it provides would be welcomed by most pilots. I also ordered the 7-cell, 350mAh Sanyo Ni-Cd that the instructions recommend. I chose to use a GWS R4P receiver, two GWS Naro servos and an Ikarus 5A ESC. I controlled all of this with my trusty Hitec Prism 7X with a Spectra transmitter.

Anticipating that the Demoiselle wouldn't care for wind, I awaited a calm evening for my first flight. I chose to launch it off an asphalt strip, as hand-launching would be very difficult.

TAKEOFF AND LANDING

With the power up, the Demoiselle lifted off in about 10 feet and began a stately climb at an incredibly low speed. The trim seemed excellent, and the controls were responsive without being touchy. The manual suggested using the throttle as the primary control for the landing, and I heartily agree. My efforts to cut the power too quickly and trim the glide with the elevator were messy, to say the least. After a few go-arounds, I got the hang of simply dropping power slowly as the bird settled and flaring right at touchdown with the elevator.

SLOW-SPEED PERFORMANCE

Pretty much all flight with the Demoiselle is at slow speed, but in this area, it excels. I settled into doing a few laps around the area and began to feel out its turning qualities. The elevator could be used to really tighten up a turn, and the return to level was very prompt. As you would expect of a plane like this, the handling was quite docile and predictable. It's a very comfortable model to pilot.

GENERAL IMPRESSIONS & TRIM RECOMMENDATIONS

As flying progressed over a couple of sessions, I felt that the machine would benefit from a better trim setup and possibly a different battery. Originally, I had set the CG near the front of the range shown in the instructions, but this required a noticeable amount of up-trim for level flight. I moved the battery to the rear of the platform, resulting in the CG's moving back to near the aft limit, and I tried again. This time, the elevator trimmed right at level, the handling was fine, and the takeoff and climb were definitely peppier. With the trim issue solved, I decided to substitute a 7-cell, Sanyo 270mAh battery for the standard 350 pack. This resulted in even more pep, with more margin for cruising. It seems that the 270 battery has a lower internal resistance than the 350, so its performance at higher drains is improved.

These two adjustments made the already good flying Demoiselle even more enjoyable. Although not a plane I would recommend to a beginner, it certainly is easy to fly because of its very low speed.

The kit's packaging was typical of Sig—roomy and colorful, with a detailed illustration on the front of the box. Digging in, I found that the kit was complete; even the required Litespan covering was included. The instruction manual is unusually good and has many pictures that illustrate key assembly steps. There is even a brief history of Alberto Santos Dumont and his development of this Demoiselle.

As I would expect from Sig, the laser-cut parts were very well done, and a number of ingenious, specially cut parts, such as the balsa-dowel wing edges that were slotted for plywood stiffeners, were included. I found surgical-rubber tubing for the tires and ample elastic thread to simulate the scale rigging. In addition, there were several bags of small parts along with a vacuum-molded shell for the scale engine.

SPECIFICATIONS

MODEL: 1909 Demoiselle

MANUFACTURER: Sig Mfg. Co.

TYPE: antique scale slow flyer (indoor/outdoor)

WINGSPAN: 43.5 in.

WING AREA: 500.25 sq. in.

LENGTH: 34 in.

WEIGHT: 10.5 oz.

WING LOADING: 3.02 oz./sq. ft.

DRIVE SYSTEM RECOMMENDED: GWS IPS "D"

DRIVE SYSTEM USED: GWS IPS "B"

RADIO REQ'D: 3-channel with 2 servos (elevator, rudder and throttle)

RADIO USED: GWS R4P receiver with 2 GWS Naro servos and a 5A Ikarus ESC

PROP USED: GWS 11x4.7

BATTERY: 7-cell, Sanyo 350mAh Ni-Cd (also flown with 7-cell Sanyo 270mAh Ni-Cd)

PRICE: $49.99

FEATURES: all building materials included; laser-cut wooden parts and Litespan covering; detailed, photo-illustrated instruction manual.

COMMENTS: the Demoiselle is a unique subject for a scale model, and the kit is well engineered and very complete. Though not suitable as a trainer, the very slow flight speed allows a pilot who has basic skills to adapt to the handling very quickly. As a result of its fine handling characteristics, the Demoiselle can be flown in very tight areas, and it will attract attention wherever it flies. It's a unique model with tons of "personality."

HITS

- Excellent wood and laser-cutting.
- Completeness of kit—even includes covering material.
- Well-illustrated and detailed instruction manual.
- The finished model is a real attention-getter.

MISSES

- Scale fuel-tank materials not included.

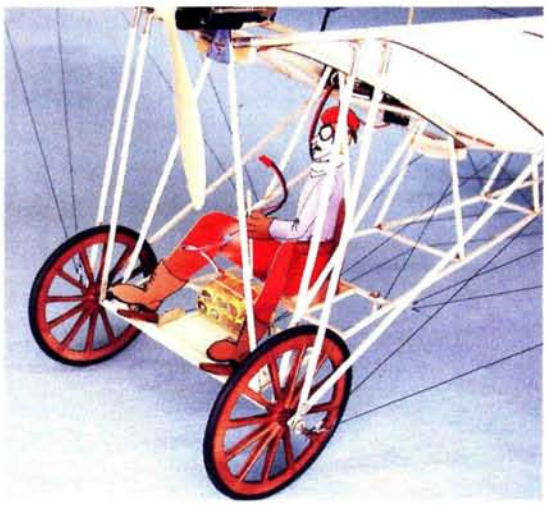
BUILDING

After reading through the manual, I realized that this kit really should be built "by the numbers"—that is, by following the manual exactly. There is quite a bit of cutting and fitting of balsa all through the fuselage and tail, so you will need a very sharp hobby-knife blade and a suitable cutting surface.

Fuselage. The fuselage is built by first constructing the vertical frames over the plan followed by the bottom frame. The finished vertical frames are added to the bottom frame along with the top longeron. Various gussets, frame members and the radio tray round out the preliminary fuselage construction. Remember that this frame is not covered, so keep those joints neat, and sand everything smooth. Various details are added at this stage, including rigging posts, tailskid, wing mounts, seat and motor-mounting stub.

Wings. Prepare the balsa-dowel edges with a light sanding, and then glue in the plywood braces. The wing panels are assembled over the plan—nothing tricky here; just follow the steps and keep things in order. When the wings have been sanded smooth, fit them with the aluminum-tube mounting sockets, which are glued to the fuselage. This step requires an extra set of hands to keep the wings aligned and avoid getting glue in the wrong place. The result is a sturdily mounted set of removable wing panels.

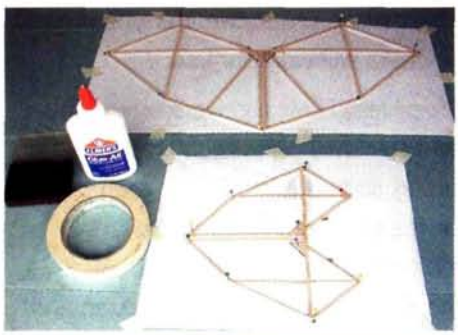
Landing gear. This is an important feature of this model and should be done as neatly as possible. The wheels are assembled from laser-cut balsa parts that are glued together and then fitted with the surgical-rubber tires. The rubber is a clear amber color as furnished, but it can be dyed black with Rit, and I recommend this for more realistic-looking wheels. I sprayed the balsa parts of my wheels with a light coat of brown paint in an attempt to simulate wood. The spreader bar for the wire axles is a length of the round balsa dowel with holes drilled in the ends for the wires. It was not

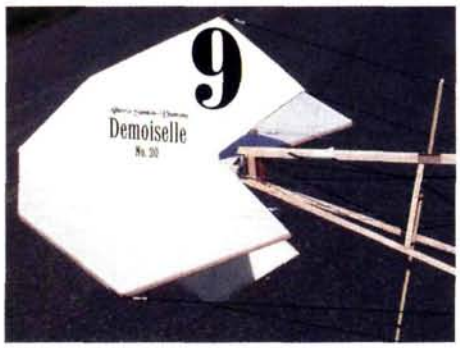


The wheels and landing gear are prominent on the Demoiselle, so it is important to make them look right. I dyed the surgical tubing for the tires black and sprayed the wheel spokes and rims with a light coat of brown paint for a more realistic look.

mentioned in the instructions, but I wrapped the ends of my balsa dowel with thread and wet it with CA to help prevent the wire axles from splitting the balsa in a heavy landing (I'm good at that). There are a variety of 1/8-inch balsa struts that are fitted with 1/64-inch plywood end reinforcements. These struts are attached at the axle and at several clever wire clips on the wings. Since the struts and wheels will be permanently mounted on the axles, it is important to check everything a last time before you bend the axle ends down.

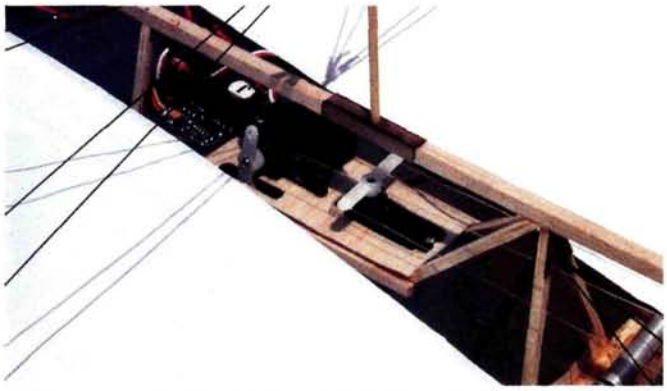
Tail. The tail surfaces are flat frames of 1/8-inch balsa assembled on the plan and then fitted with cute little 1/64-inch plywood rigging points. The tail is covered with the Litespan at this point. There are a variety of decals on the vertical tail, and I was leery of applying them after the frame had been covered, so I marked the outline of the rudder on the covering and applied the decals to the shiny side of the Litespan. I then taped the Litespan to a work surface, pulling it taut as I went. I then put a thin coat of Elmer's white glue on the edges of the frame and pressed it down on the covering. This worked so well that I used the Elmer's glue to attach all of the covering on the model. The entire tail swivels up and down and side to side on a very clever universal joint assembled from parts in the kit. This joint is sufficiently rigid and operates smoothly. My only contribution to this assembly was to use JB Weld epoxy instead of CA to join the two aluminum tubes.





I thought applying decals after the tail had been covered would be problematic. Instead, I traced the tail frame on the Litespan, and then I applied the decals to the other side in the correct positions. Only then did I tape the Litespan down taut to my work surface and attach it to the frame with Elmer's glue. The result came out great—much smoother than if I had covered the tail first.

The universal joint is now mounted on the fuselage, and the tail is glued into place. It's easy to get CA in the wrong places, so be very careful. It's also important that the tail be square to the wings as you complete this assembly.



A tray between the wings holds all the radio gear. The pull/pull cables and all the scale rigging go together smoothly as long as you follow the instructions exactly.

RC gear and final details. The gear is now installed on the radio tray. Everything is clearly covered in the manual, including the rigging of the monofilament pull/pull control lines. Following the instructions, it all went very smoothly. More details—such as the rudder pedals, battery holder and the pilot—are added at this stage. As mentioned, I chose to attach the covering to the wings with Elmer's white glue and was able to pull enough tension in it to avoid any heat shrinking. It's not drum tight, but it's still smooth enough for my taste.

The details of the dummy engine are added at this stage. You can choose to leave it very basic, or you can follow the manual and jazz it up with lots of little pieces. It is a very prominent feature of this model, so I chose to detail it following the pictures and suggestions. The dummy engine is attached to the front of the GWS IPS gearbox in a very clever way, but it may be a tad difficult to remove it once it has been installed, so keep this in mind as you set up the power system. One minor detailing issue concerns the fuel tank; it's a very prominent feature of the machine, and the manual clearly details how to construct it, but no material is provided. No big thing, but I was a bit surprised at its omission.

The scale rigging is made of provided elastic thread, and it adds a great deal to the model's character. The designers have worked out some very clever methods for fishing the thread through various holes and swages. The rigging is designed so that the wings are removable when the model is complete. I spent just about as much time with the final detailing as I did with the basic construction, but it really is worth it.

The vacuum-molded engine pieces are provided, and the instructions show you how to add all the little scale details like the pushrods and plug wires. Oddly, the material for constructing the fuel tank is not included in the kit, though the instructions show you how to make one on your own easily enough.

CONCLUSION

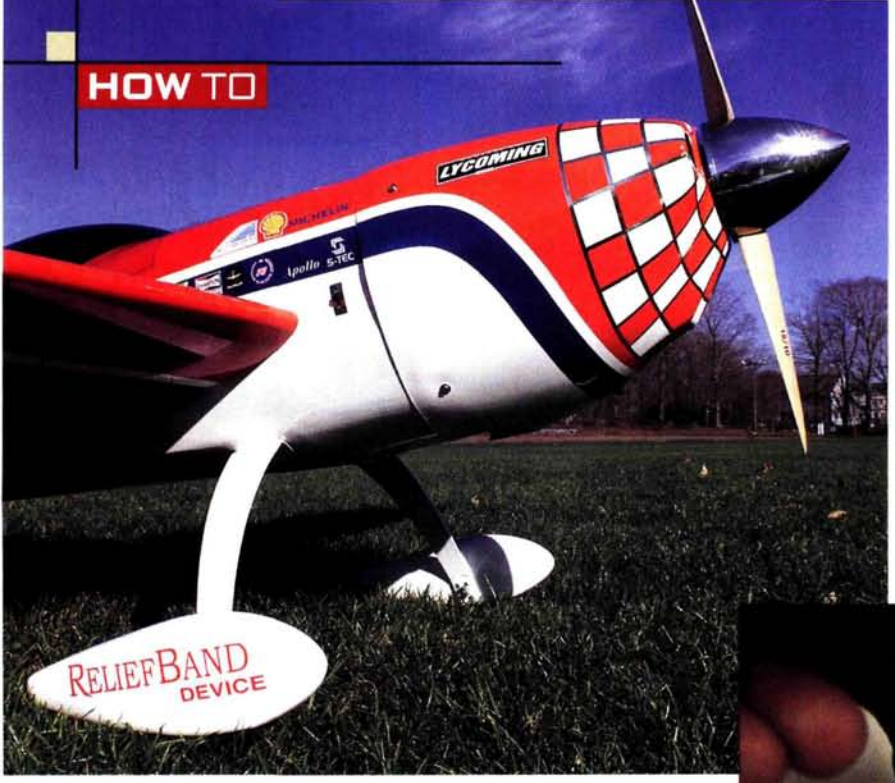
The Demoiselle is a real charmer in the air, and many heads turn as it floats along like a ghost from the past. As kits go, the construction is not particularly difficult, but it does take some time, and you should follow the instructions exactly. When complete, the Demoiselle looks wonderful, especially if you take the time to dress it up with all the optional scale details. It flies with a gentle grace that befits its elegant look—very slow and smooth yet still sufficiently responsive. Try it; you'll like it. ✈

GWS; distributed by Balsa Products (732) 634-6131; balsapr.com; Horizon Hobby Inc. (800) 338-4639; horizonhobby.com; and Maxx Products Intl. (847) 438-2233; maxxprod.com.

Hitec RCD Inc. (858) 748-8440; hitecrcd.com.

Ikarus; distributed by R/C Direct (858) 277-4531; rc-direct.com.

Sig Mfg. Co. Inc. (800) 247-5008; sigmfg.com.



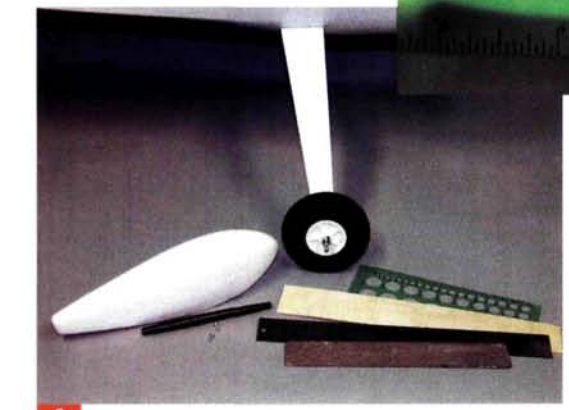
Install wheel pants

Easy dress-up without a lot of work

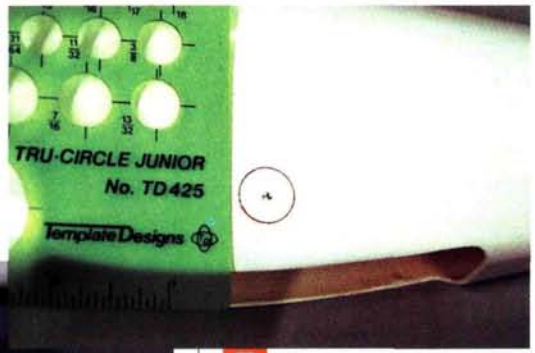
by Rick Bell

Wheel pants put the finishing touches on many sport and scale models; in fact, many airplanes just don't look right without them. In addition to looking good, they help decrease drag and increase performance. You can easily and quickly enhance just about any model's looks by adding wheel pants, and they can be added even after you've built and flown the model.

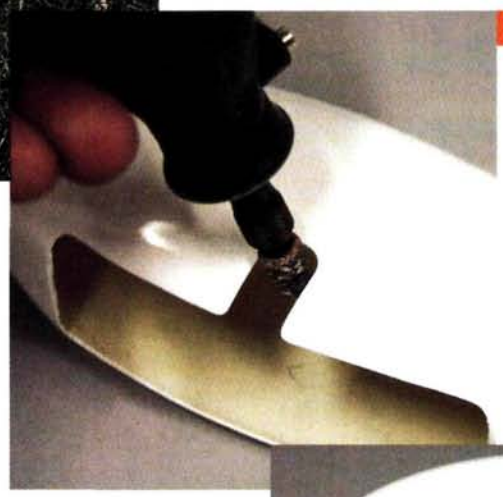
This process is simple and it allows the pants to be removed easily for maintenance, and more important, it prevents the pants from rotating around the wheel axle. For this article, I used the Great Planes ¼-scale Extra 300S. It comes with painted aluminum landing gear and painted fiberglass wheel pants that save a lot of finishing work. Let's get started!



1 First, assemble the tools and materials you'll need to make the mounts and to cut out the fiberglass pants. You'll need a felt-tip pen, a circle template, a ruler, a Dremel tool with a tapered stone, a Perma-Grit sanding bar (or its equivalent) and plywood. I used two layers of 3/32-inch birch plywood that I laminated to obtain a thickness of 3/16 inch.

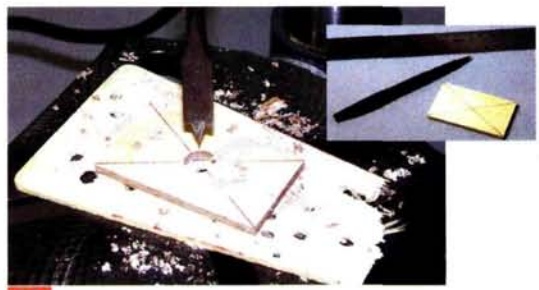


2 After you've made the cutout in the bottom of the pant for the wheel, you must determine where the pant will go in relation to the wheel. Centering the wheel in the cutout and placing the pant in such a way that it leaves about half of the wheel exposed works well for grass runways. After you have marked this central point, draw a circle around it. Be sure to do this on the side of the pant that will contact the landing-gear leg. The diameter of the hole should be a little larger than that of the axle's mounting flange. For the Extra, the axle flange is 7/16 inch in diameter, so a ½-inch-diameter hole is required. Now draw parallel lines on each side of the circle to the bottom of the pant to form a slot.

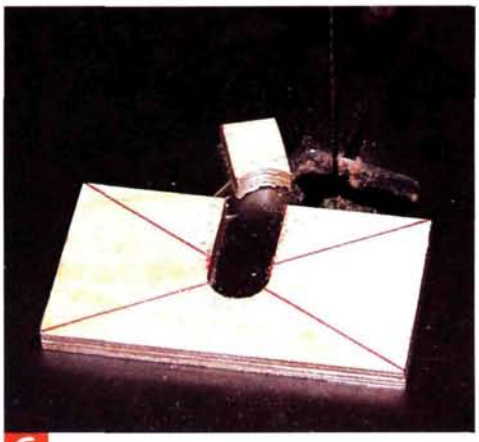


3 Using the Dremel tool set at a medium speed and using a tapered stone, grind away the fiberglass between the two parallel lines you drew. Be sure to wear a dust mask while you grind the fiberglass. Go slowly, and remove only a little material at a time. It's very easy to gouge or chip the fiberglass. When you've finished, you should have a slot that goes to the bottom of the pant.

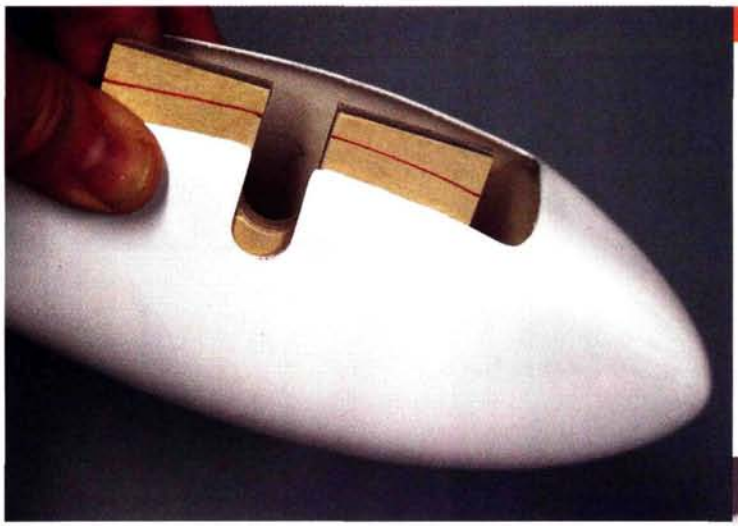
4 Next, determine the size of the plywood mount that will be glued to the inside of the pant. I usually make the pad as large as the flattest area inside the pant; in this case, it's 3x1½ inches. Because the wheel pants are rather large, I laminated two pieces of plywood together to give the mounting screws more to bite into.



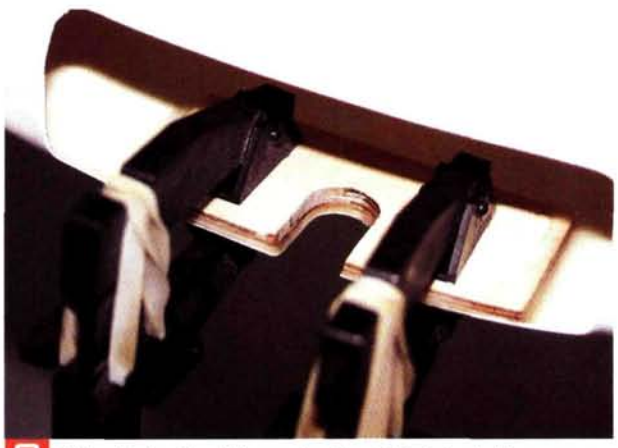
5 Mark the center of the plywood by drawing a diagonal line from corner to corner. Using a drill press and a ½-inch spade bit, drill a hole in the center of the mount. Place a scrap piece of plywood under the mount to prevent it from splintering. If you don't have a drill press, you could use progressively larger drill bits with a hand drill to make the hole.



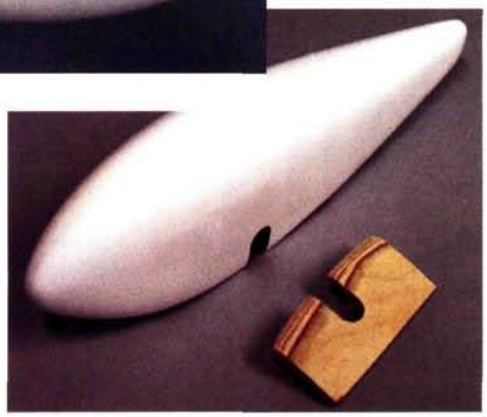
6 Again, just as you did on the pant, draw parallel lines from the hole to the bottom of the mount, and then cut away the excess wood. Using the sanding bar, lightly sand the cutout to smooth the rough edges.

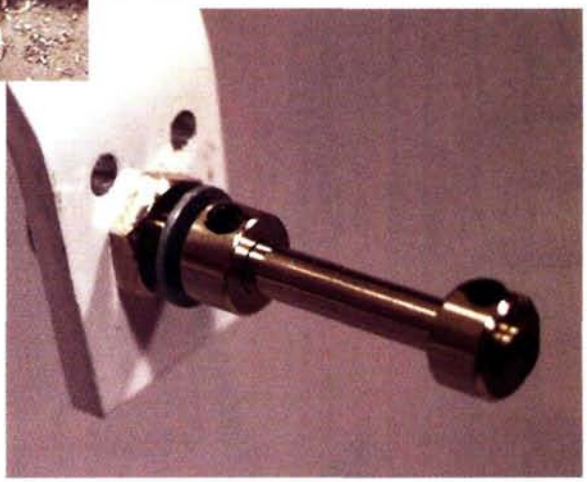


7 Place the plywood mount inside the pant, line up the cutouts, then trace the bottom of the pant on the plywood. Cut off the excess wood, and sand the mount to match the inside contours of the pant. For maximum strength, you want the plywood to fit without any gaps.



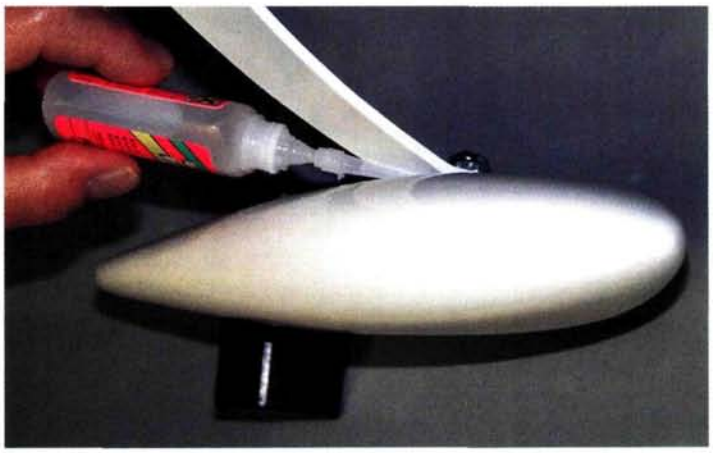
8 Wipe the inside of the pant with rubbing alcohol to remove any residue left after the molding process, and then scuff inside it with some 80-grit sandpaper. Again, wipe it with rubbing alcohol to remove all traces of the sanding dust. Liberally apply slow-curing epoxy to the inside of the pant and to the plywood mount, and clamp them together, being sure to match the slots. Wipe away any excess glue. If you want, you could further reinforce the inside of the pant by laying a layer of fiberglass cloth over the plywood. Unless the fiberglass wheel pant is really thin, I don't find this necessary.

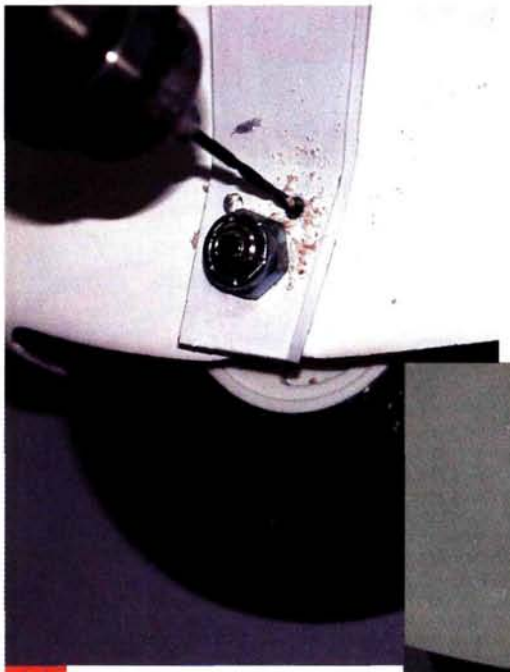




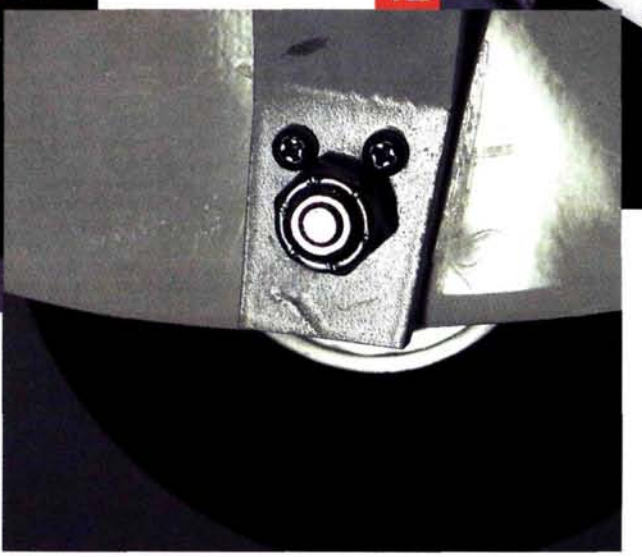
9 Next, drill the holes for the mounting screws in the landing gear. Make sure that your screws fit through the holes. Now install the wheel (wheel left off for clarity), retaining collars and spacers, if needed. Slide the pant over the wheel, and check for proper clearance; the wheel shouldn't rub the pant anywhere. Adjust, if necessary.

10 When you're satisfied with the fit, prop up the fuselage so it's level. Using a wooden block or something else under the rear of the pant, adjust it until it's also level. Now tack-glue the pant into place with a few drops of thin CA.



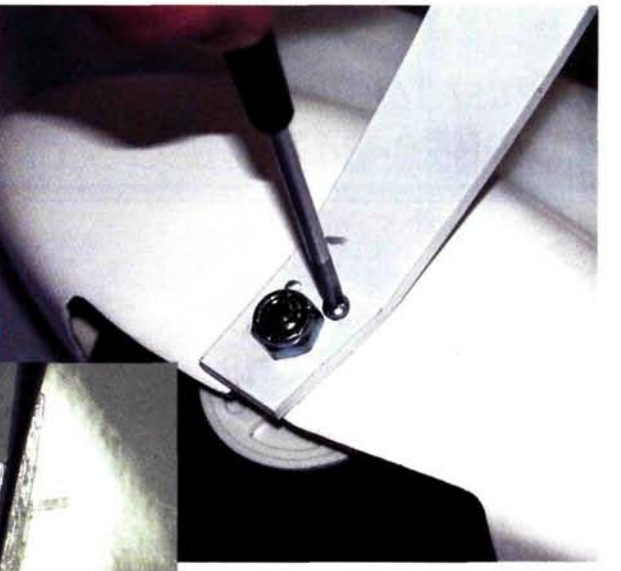


11 Carefully transfer drill holes into the pant. Be sure the holes are smaller than the screws you intend to use. You may use blind nuts instead of screws.



Install the screws to secure the pant, and you've finished! If you used wood screws, it's a good idea to remove them and harden the plywood with a couple drops of thin CA.

12



Wheel pants add that finishing touch, and they're easy to install. With a little effort, you can enhance your model's looks and increase its performance. Why not dress up your next project!

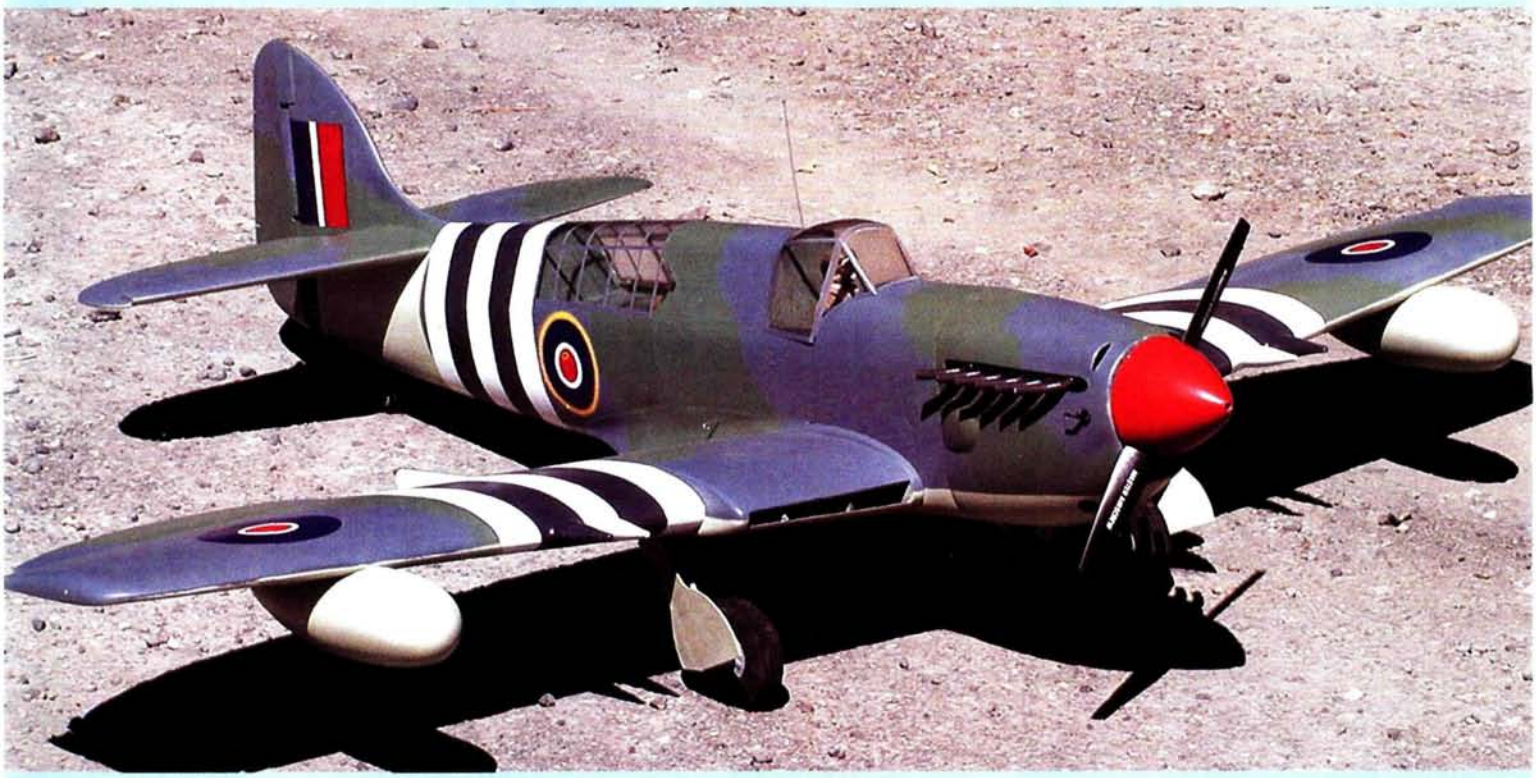
Great Planes Model Mfg. Co.
(800) 682-8948; greatplanes.com.

THE FAIREY FIREFLY

A .25-size British fighter-bomber

by Vance Mosher

The Fairey Firefly was a British-built, two-seat fighter-bomber from the WW II and Korean War eras that had a very long service career aboard aircraft carriers. The Firefly shown here is a later, Mk. IV variant, with wing-mounted radiators, a radar pod and a long-range fuel tank. Several Firefly models were flown without pods and guns. Because it had such a long service life, the Firefly had several distinct color schemes; the one shown is the late-WW II green and gray "disruptive" scheme.



SPECIFICATIONS

MODEL: Fairey Firefly Mk. IV/V

TYPE: 1/10-scale fighter-bomber

WINGSPAN: 49.5 in.

WING AREA: 481 sq. in.

WEIGHT: 4.75 lb.

WING LOADING: 22.75 oz./sq. ft.

ENGINE RANGE: .25 to .40 glow or electric

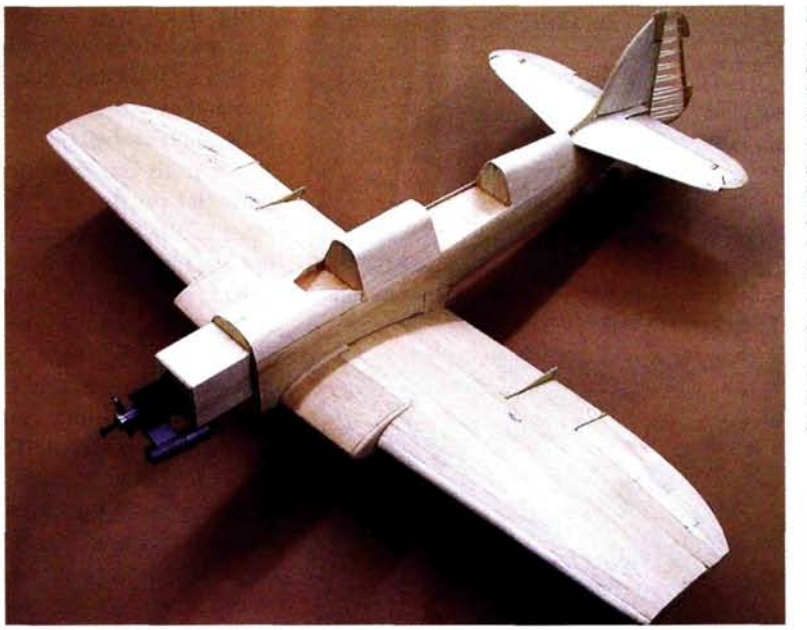
ENGINE USED: O.S. .25

RADIO REQ'D: 5 to 6 channels (rudder, ailerons, flaps, retracts, throttle and elevator)

RADIO USED: Airtronics Stylus

PROP USED: 10x6

COMMENTS: designed by Vance Mosher, this Fairey Firefly is a 1/10-scale model of a WW II and Korean War-era British naval fighter-bomber that served aboard aircraft carriers. It uses traditional lightweight balsa and plywood construction, and the plans feature detailed illustrations for the scale flap mechanism used on the full-size aircraft.



Here's the completed model, ready to cover. Note the engine-extension box structure that's attached to the front of the fuselage. It slides into place and can be moved in and out to adjust engine position.

I designed the model to meet several goals. It had to be suitable for both electric and glow power, it had to be easy to transport, and it had to be affordable. I wanted a project that even a reasonably new scale modeler would be able to build. And, of course, it had to fly well. I am pleased to say that the Firefly met all of these requirements.

The principal design challenge was to keep its weight down so that it would fly nicely and could be electric powered. With flaps, guns, wing pods, engine cowl and canopies, the painted airframe weighed 2 pounds, 12 ounces, and its finished weight was 4 pounds, 12 ounces. The airplane flies well with a plain-bearing O.S. .25 FP turning a 10x6 prop. An engine that's 2 or 3 ounces heavier would also be OK; to balance correctly, my model (with a very light muffler) needed 2 ounces of lead in the nose.

This model is really scale, and all of the parts and jigs are shown on the plans. Servo locations and control-actuation setup are shown in detail. Control-surface hinging is scale and simple.

The Firefly had patented Fairey Aviation flaps known as "Fairey-Youngman Area-Increasing Flaps." The flaps moved down and rearward before they tipped downward. For long-range cruising, pilots could extend the flaps only partway to create a sort of "biplane" effect that increased the wing area. Using balsa, plywood and a dowel, the scale flaps are simple to build. Optional, simplified flaps (and a no-flap wing) are shown on the plans.

CONSTRUCTION

Simple jigs help keep the model straight. To minimize weight, the fuselage is basically a "tub" structure with a few formers and curved top and bottom sheeting. The

FLIGHT PERFORMANCE

The balance point shown on the plans is fine for the typical pilot, but hot dogs can move it rearward another ¼ inch or so without getting into trouble. Removing the wing pods will make it sportier (but less attractive, too). If you take them off, check the balance.

The Firefly's light construction really pays off when you fly it. The model grooves like a fighter at higher speed and acts like a trainer at low speed. Powered with an O.S. .25 FP turning a 10x6 prop, the Firefly's top speed is about 40mph. It looks really scale on those full-throttle, low-altitude passes. Spectators love it!

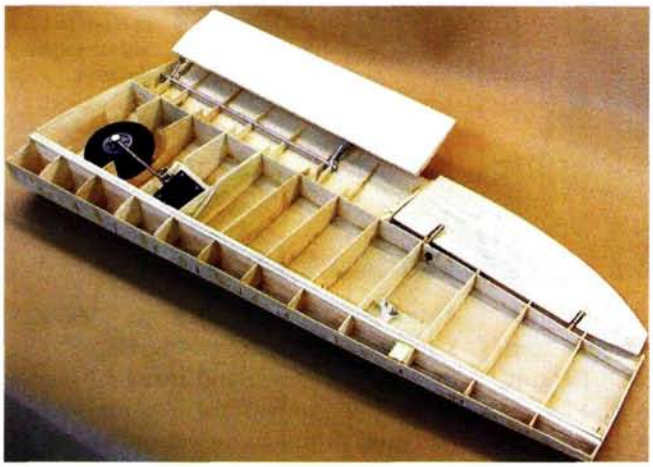
TAKEOFF AND LANDING

The model takes off very realistically, but you can jump it off in as little as 25 feet. Landings are very gentle and smooth and can be slowed down to less than 20mph. The short, wide landing gear are a delight, and there is no tendency to bounce on landing. So far, all landings have been crosswind, and rudder corrections create no roll problems. The flaps aren't necessary at all for slow landings, but they are cool.

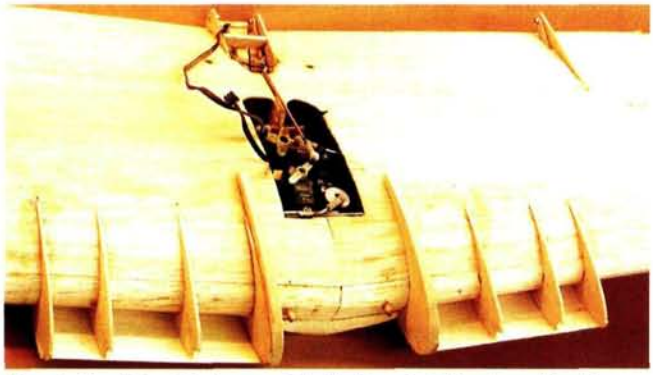
AEROBATICS

The Firefly easily does all scale aerobatics. It is very stable, even with the wing pods installed. The model will go into a spin, but you have to push it. The Fairey Firefly is a delight to fly and a delight to observe.

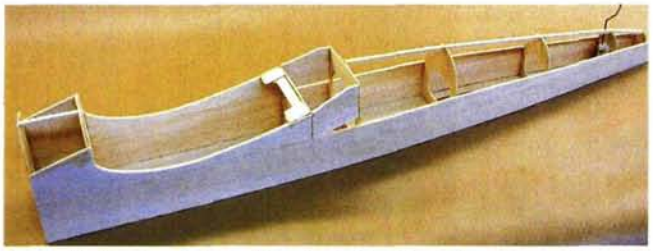
The wing uses egg-crate construction for straightness and strength. Notice the interlocking half-slots in the spar webs and ribs.



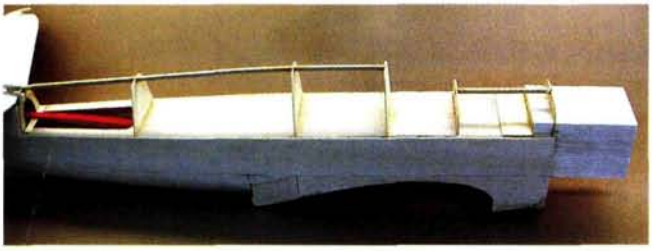
The landing gear, flaps, ailerons and their control linkages should all be installed before you sheet the bottom of the wing.



The wing radiator inlets are added to the wing structure after the wing panel has been sheeted.



Assemble the fuselage with its deck sheeting flat on the workbench. The sides are made from ⅛-inch balsa sheet.



After you've sheeted the bottom of the fuselage, flip it over and add the top formers to the deck sheeting.

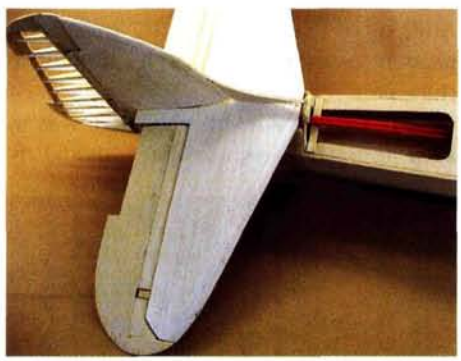
wing uses "egg-crate" construction for straightness and building ease. The tail is a mix of jig-built and half-shell pieces. The ailerons and flaps are built flat on the bench. Most of the construction jigs are made of ordinary balsa sticks.

Egg-crate wing construction means that the spar webs are cut to shape and have half slots cut into them for the half-slotted ribs to fit into. This accurately positions the ribs and holds them in place during construction. The spar also acts as a shear web and makes the wing stronger. The ⅛-inch-square balsa main spar caps are glued onto each side of the web. To build in washout and to keep everything straight, the wing is built with a balsa stick placed under it as shown on the plan. The top sheeting should be glued on while the wing structure is still pinned to the workbench. The wing panels are then removed from the board and set upside-down into the cardboard jigs. While the wing is on the jigs, install the bottom spar caps, the flaps and aileron controls and the retracts. Sheet the wing bottom before you remove the wing from the jigs. Note: the rib slots have the washout built in, so you don't have to twist the spars out of shape.

The fuselage is built around the deck sheeting, and formers are added (above and below it) to produce the fuselage's oval shape. To make sheeting the structure easier, ⅛-inch balsa (glued on edge) is added to the outer edges of the deck sheeting. This provides increased thickness so that this area of the fuselage can be sanded to shape. The fuselage bottom is sheeted while the fuselage is attached to the workbench. After the sheeting is in place, the fuselage becomes stiff enough to be removed from the bench. This makes control installation much easier. You can see what you are doing through holes in the deck.

The tail surfaces all have the correct airfoil shape and taper. The fin and rudder blend nicely into the rear of the fuselage. The rudder is film-covered, and the plans show the correct number of ribs. You could probably save half an ounce by installing fewer ribs. The ribs are rough-cut balsa triangles which you then sand to shape after they have been glued on the top and bottom of the 1/32-inch balsa-core sheet. This is simple to do and saves a lot of fussy parts cutting. There are only four ribs in the stabilizer and four in the fin. The control surface hinging is also scale and is simpler to make than commercial hinge installations.

Here you see the rudder complete with its control linkage installed. Note the scale hinging method.



To simplify assembly, the tail surfaces and their control linkages should be installed before the top of the fuselage is sheeted.

Using the bench top as a measurement reference, place the wing on top of the upside-down fuselage. With the fuselage deck sheeting laid flat on the bench, make sure that the measurements between the bench top and each wingtip are equal. Install the tail surfaces in the same way. Install all of the tail controls and servos before you install the fuselage top. Attach

Continued on page 86

The Royal Navy's heavy hitter

Fairey Firefly

by Budd Davisson

When we think of fighters, we invariably think of nimble little buggers in which a single man pits himself against another pilot in a similar machine. It is the classic winner-take-all contest in which a dusty Western street of a gunfight is replaced by the hard blue of a high-altitude sky. But it hasn't always been that way—at least, not in 1940s England.

Toward the end of the 1930s, a faction within England's government argued for a two-place fighter concept in which the armament would be concentrated in a turret in the back seat. The embodiment of this concept was the infamous Boulton-Paul Defiant, an airplane that looked like a Hurricane clone with a bomber turret stuffed into its fuselage, behind the pilot. The airplane was so heavy, however, that it couldn't get out of its own way in a dogfight; as a result, it was dead meat against anything the Germans threw at it. To save its crews, it was quickly withdrawn from combat.

The Fairey Firefly was created at the same time, and it conformed to the same government specifications as the Boulton-Paul Defiant, so it was foreordained that it would be a two-place machine. Fairey Aviation Co., however, reasoned that it made no sense to build a fighter that couldn't fight. Therefore, its Firefly, which evolved out of the much lower-powered Fulmar, was designed to be a he-man machine from the get-go.

As the Firefly was taking form on the drawing board, war was knocking on Britain's front door, and Royal Navy brass hats saw that they'd need more than just another fighter; they needed something thoroughly modern that had long-range capabilities and packed a massive punch. So while still in its design stage, the Firefly began to take on the form of a multi-use weapon. It would be the ultimate do-everything bird for the fleet and would be designed for both long-range reconnaissance and hardcore fighter-bomber duty. In fact, its four 20mm cannon and bomb load made it a serious player in combat actions that included sinking the Tirpitz in the ETO to bombing Sumatran oil refineries in the Pacific. Eventually, the RNAF used it for everything they could think of. It became one of the most useful, multi-role airplanes of the War.

Pilots loved the airplane because its light controls and quick roll rate gave it the pugilistic personality of a fighter. Loaded, it weighed twice as much as a Spitfire but was powered by the much larger, 2100hp Rolls-Royce Griffon engine; it may have been big, but it could really boogie and those cannon made hash out of anything in its sights.

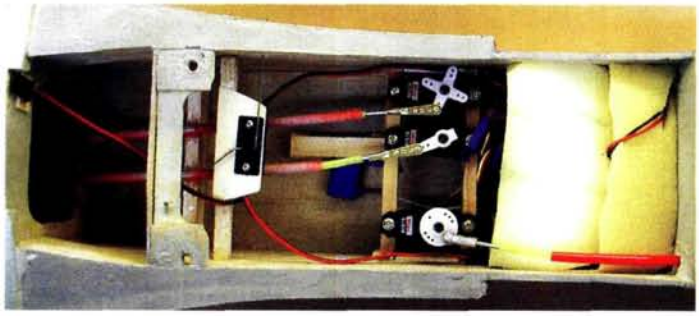
According to its pilots, when the Firefly wasn't carrying bombs or rockets, you couldn't tell you weren't flying a fighter. In fact, with its Fairey-Youngman slotted flaps run out a few degrees (they slid back and then down, like Fowlers), it could actually hold its own in a dogfight. In fact, pilots loved the way it did aerobatics—big, smooth and always under control.

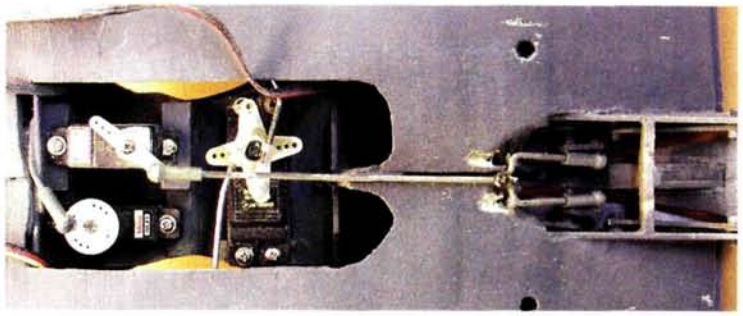
When "landing on"—the Brit phrase for carrier landings—the traditional curving approach was flown, but the airplane's response to power and controls, combined with its weight, was such that pilots said it easily settled into the groove and was a pleasure to bring on board.

The seriously flawed concept of the two-man fighter died early in WW II, but out of it came one of the most utilitarian Allied aircraft ever designed: the Fairey Firefly.

Our thanks to Jim Newman, who crewed what was possibly the only Firefly operated by the Royal Air Force (not Royal Navy), for his personal observations on flying the airplane.

PHOTOS BY XAVIER MEAL





Above left: there's plenty of room in the fuselage; radio installation is easy. Right: since they're installed in the middle of the wing, the retract, aileron and flap servos are easy to access.

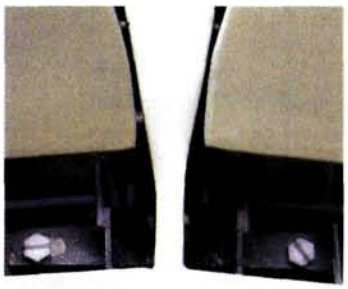
the fuselage top after all flight surfaces have been installed and aligned, and the control rods have been attached to them.

FINAL ASSEMBLY

The wing hold-down bolts' heads are hidden under the flaps, and you can pull the flaps into the open position with your fingers to install the bolts. The engine is mounted on a rectangular box structure that is glued into the front of the fuselage. You can slide the box in and out to accommodate engines of various lengths. It's easy to make everything square. A benefit of using the box structure is that it can also hold the batteries if you electrically power the model; you'll just need to make it longer and cut a few air holes in it.

The fuel tank is easily accessible from under the engine box and in front of the firewall.

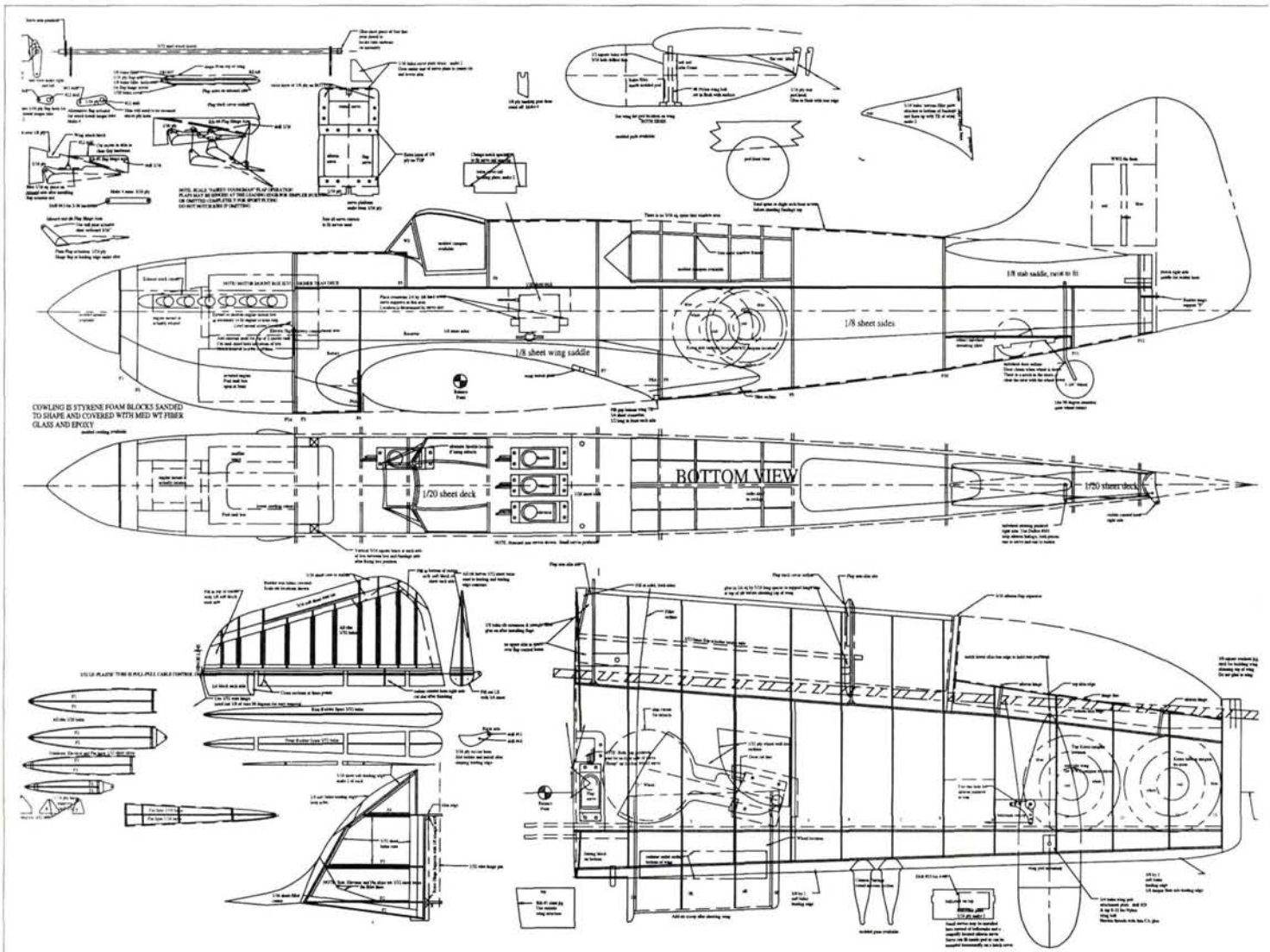
Most stock mufflers are meant to fit outside a fuselage, so they don't fit inside the cowl. Using



The wing hold-down bolts are hidden in the flap wells. To gain access, move the flaps out of the way.

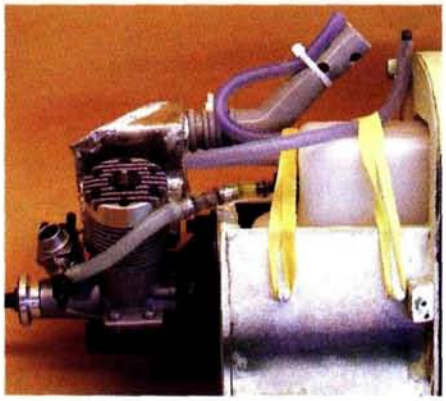
The Fairey Firefly FSP0303A

Designed by Vance Mosher, this Fairey Firefly is a 1/10-scale model of a WW II and Korean War-era British naval fighter-bomber that served aboard aircraft carriers. It uses traditional lightweight balsa and plywood construction and features the scale flap mechanism used on the full-size aircraft. WS: 49.5 in.; power: .25 to .40 glow or electric; 5 to 6 channels; 3 sheets; LD 3. $24.95



To order the full-size plan, turn to "RCStore.com" on page 152.

aluminum sheet, aluminum brazing rod and a propane torch, I made one that fits inside. It's lighter and quieter than the original muffler. You can make your own engine cowl from styrene foam and fiberglass, or you can buy one from me. Canopies can be made from part of a commercial P-51 canopy and flat-wrapped sheets. I've included windshield-frame templates on the plan. You can adjust windshield corner bends with your covering iron. The rear canopy is made with a flat-wrapped plastic sheet. To make the aft canopy, soften the plastic with a heat gun, and drape it over cardstock covering the opening.



Left: to keep everything inside the engine cowl, I used a homemade muffler. Note that the fuel tank is easy to get at from under the engine-extension box. Right: to save some labor, you can buy the molded engine cowl, spinner and scale exhaust stacks from me.

PAINT AND FINISH

I covered the model with a base of 0.8-ounce fiberglass cloth and alcohol-thinned epoxy. This added only 4 ounces to the model's weight. I then primed it with F&M Enterprises Feathercoat and painted it with Cheveron Dark Green (or Duck Egg Blue for the Korean scheme) and Extra Dark Sea Grey. All the insignia sizes and shapes for both the WW II and Korean War versions are on the plans. These are simple circles and rectangles, so I painted them on. The insignia colors are Floquil Reefer White, Reefer Yellow, Caboose Red, Dark Blue and Grimy Black. I used MinWax Satin spray urethane as a clear overcoat to blend everything in and to add some aging. All of this paint added 3 ounces to the model's weight.

I vacuum-formed the wing pods; you may also make them out of foam and finish them with fiberglass cloth and resin. They are bolted onto the wing and are removable.

A bill of materials for the new scale builder is available by taking the Click Trip. I also sell molded canopies, engine cowls, wing pods, wingtips, guns, scale exhaust stacks and decals; just go to my website at http://www.vanvan.us/, or contact me in care of *Model Airplane News*. ✈

F&M Enterprises *(817) 279-8045; stits.com.*

O.S.; *distributed by Great Planes (800) 682-8948; osengines.com.*

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Saito FA-100GK

Displacing the FA-91 & setting a new standard

Over the years, I've flown many 4-strokes, and all were powerful and reliable when operated and maintained properly, but that isn't the main reason I like them; mostly, I just love that 4-stroke sound! Let's face it: a 4-stroke engine has three times as many parts as a 2-stroke and is heavier and more expensive than a 2-stroke of equivalent power. But you just can't beat that great 4-stroke, Harley-like "putta-putt-putt" sound! That its inherent torque advantage allows a 4-stroke to swing a larger prop at lower rpm is a welcome perk, but even without that secondary benefit, I'd use 4-strokes for the sound alone. So when it was time to pick a powerplant for my new Hangar 9 P-51 Mustang, the new Saito FA-100 4-stroke was an obvious choice. For aesthetic reasons, I selected the Golden Knight version for this review.

You can't talk about model 4-strokes without mentioning the Saito brand, which is sold and serviced in North America by Horizon Hobby Inc. I've always been impressed by Saito engines' power, reliability and quality, and the new FA-100 appears to be ready to carry on that tradition. Saito makes only 4-strokes, and they range in displacement from .30 to 1.8ci for single-cylinders to .60 to 4.5ci for multi-cylinders. Saito engines' most distinctive feature is the one-piece head/cylinder design, for which the company claims cooler running, less chance of compression leaks and less weight. Also worth noting is the cast-in, chrome-plated aluminum sleeve and, on all the singles, a reversible carb.

If you haven't owned a 4-stroke, you're missing one of this sport's most satisfying experiences. When I first flew one, it felt a little down on power compared with the 2-strokes I was used to. This was because of its relatively low exhaust frequency, but then a vertical climb almost out of sight erased that perception forever; let's hear it for torque! Early 4-strokes did lack the peak power of 2-strokes, but today's models rival them in many applications.

At first glance, it's apparent that the Saito FA-100 is different from its other single-cylinder stable mates. The cam cover and the crankcase in the cam area have a unique shape. Horizon explains that the new design is part of an ongoing effort to save weight; a similar design is used on certain Saito multi-cylinder engines—the 300 twins and the 170 and 450 radials, for example. The new FA-100 is only 30 grams (1.06 ounces) heavier than the FA-91's but a whopping 350 grams (12.3 ounces) lighter than the FA-120's. That's only a 6-percent weight increase compared with the 91, but the FA-100 produces 13-percent more power.

As previously stated, I tested the FA-100 Golden Knight (GK) version. Saito offers all of its engines in standard natural aluminum and as a GK version, which has a glossy black finish with "golden" valve covers. The GK option is purely cosmetic and offers no advantage beyond style.

SPECIFICATIONS

ENGINE: FA-100GK
MANUFACTURER: Saito
DISTRIBUTOR: Horizon Hobby Inc.
WARRANTY: 3 years
DISPLACEMENT: 1.04ci (17.1cc)
BORE: 29mm
STROKE: 26mm
LISTED OUTPUT: 1.8hp
PRACTICAL RPM RANGE: 2,000 to 10,000 (static)
WEIGHT: 19.4 oz. (w/out muffler), 20.9 oz. (w/muffler)
WIDTH: 2.36 in. (60mm)
LENGTH: 4.53 in. (115mm)
SHAFT DIAMETER: 8mm, M8x1.25 thread
PRICE: $299.99

HITS
- High power-to-weight ratio
- Fits many .60 (2-stroke) planes
- One-piece cylinder-head
- Good idle and transition
- Reversible carb

MISSES
- None

PROP PERFORMANCE

PROP	PEAK RPM (1)	LOWEST IDLE RPM (2)
APC 15x7	8,800	1,750
APC 14x10	8,400	1,900
APC 14x8	9,600	1,800
APC 13x11	8,800	2,000
APC 13x10	9,400	1,950

This data was obtained using Cool Power 15-percent-nitro, 20-percent all-synthetic-oil fuel; O.S. F plug.

Never fly at peak rpm; instead, back off 200 to 300 on the rich side of peak. For flight, after adjusting the low-speed mixture for the lowest possible idle, as a safety margin, increase the idle rpm 200 to 300 with the transmitter trim.

SIZE AND OUTPUT COMPARISON OF .91, 1.00 & 1.20 SAITO ENGINES

	FA-91	FA-100	FA-120
Distance (prop-drive hub to back of carb (in.)	4.57	4.53	5.43
Height overall (in.)	4.61	5.04	5.24
Width overall (in.)	2.36	2.36	2.71
Approx. weight w/muffler (oz.)	19.8	20.9	33.7
Weight w/out muffler (oz.)	18.3	19.4	31.7
Horsepower	1.6	1.8	2.2
Typical sport prop	14x6	14x8	15x8

FLIGHT IMPRESSIONS

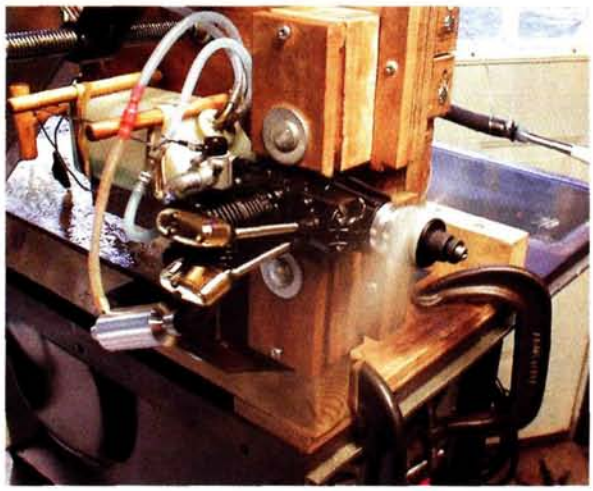
The Saito's first flight was on an unusually cold morning. I had run the engine for about 30 minutes on the test stand before installing it in my brand-new Hangar 9 P-51 Mustang, and I ran it again with the cowl installed. Having adjusted the carb a week before in much warmer weather, I checked the settings with a good run-up. I richened the high-speed needle slightly to give the same 200rpm drop from peak as originally set. My helper held the plane vertical at full throttle to check for sagging, and there wasn't any.

During two 15-minute shakedown flights that doubled as photo-shoot passes (no pressure!), the engine performed flawlessly, as it did during extended taxiing, takeoffs, vertical climbs, various aerobatics (including knife-edge and inverted passes and victory rolls) long approaches at a low idle, go-arounds and landings. Acceleration was quick and smooth, and the engine produced a lightly visible smoke trail that further reassured me that the mixture wasn't too lean.

After taxiing back to the pits, I shut down with the kill switch just like Chuck Yeager would have! A reliable engine makes flying easier and more fun—and much less stressful, especially for magazine photo shoots!

HOW IT STACKS UP

The FA-100 does not fit the same mount as the FA-91 or the FA-120; it has its own mounting-bolt pattern. It isn't a remake of an existing product; it's a new design, and most of its dimensions fall between those of the .91 and the 1.20, with the exception of the distance from the prop-drive washer to the back of the carb, which is about the same as on the .91. I've compared all the dimensions, and it's obvious that this engine could easily be used in .91 4-stroke planes.



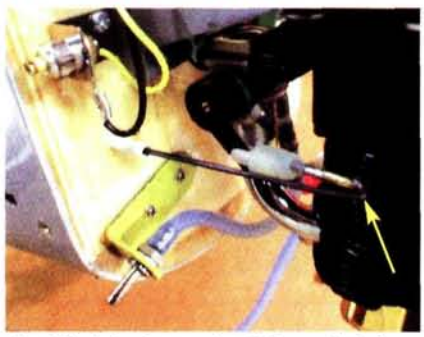
ON THE BENCH

Like many of today's engines, this Saito could have been flown right out of the box without bench running. I ran it on my test stand to become familiar with it and to make approximate carb settings before I mounted it in my new P-51. After I had set the needles, the engine was very friendly in all respects—easy to start, idled well and had great throttle transition from extended idling to full power. The owners' manual gives detailed break-in procedures both for on the bench and in flight. Always read and follow all the owners' manual instructions. The Saito's manual recommends a fuel nitro content of 10 to 15 percent. Horizon promotes the use of 30 percent, claiming more power and smoother running. I have run from zero to 30 percent nitro without a problem, but I've settled on 15 percent as a good compromise. I fly all kinds of models and find that I can run just about anything on 15 percent, including 2- and 4-strokes, .15 to 1.80 sport planes, Quickie 500 pylon racers and .60 helis. Using only one fuel type for all my models is a big convenience!

Note the unique shape of the cam cover. Similar to that used on Saito's multi-cylinder engines, this design is part of an ongoing effort to save weight.

• **Props.** For the first flight in the Mustang, I used an APC 14x8 turning 9,600rpm at peak and backed off to 9,300rpm for flight. There are many available props for this engine. As a rule, I just keep the wide-open static rpm at between 9,000 and 10,000. I had hoped to run a 4-blade prop on the Mustang, but APC says 2-blades are much more efficient, and besides, I haven't yet found a 4-blade that revs within the engine's rpm range.

• **Installation.** Most 4-stroke engines have the carb at the rear. This can complicate the throttle linkage hook-up because the carb is often too close to the firewall to allow a nice bind-free connection. I just extend the throttle rod past the carb arm, make a 180-degree bend and use a standard nylon clevis. Another method is to install a 4-stroke linkage kit that uses a nylon lever; several brands are available.



Throttle linkages can be tricky on 4-strokes because of the rear-mounted carb. An easy solution is to make a 180-degree bend in the throttle rod, as shown here.

• **Getting ready for the field.** After setting the carb with the engine in the run-up stand, I checked my settings in the P-51 before going to the field to fly. As I expected, the settings were slightly different in the airplane owing to the altered tank height and the engine's being inverted. My experience has shown that a more careful carb setup is needed with any inverted engine, whether it's a 2-stroke or a 4-stroke. Dead-stick forced landings are no fun, so it is well worth paying extra attention in this department!

I tweaked the low-speed needle 1/16 turn at a time until the idle was reliable down to about 1,800rpm, but I fly with 2,100rpm to give myself a safety margin; acceleration was instant, and there wasn't any hesitation after a long idling period. Even the best engine is useless if it isn't adjusted properly! If you aren't familiar

with this adjustment process, follow the manual and try to enlist some expert help; when you fly, having a reliable engine is everything! The supplied Hangar 9 glow plug was satisfactory, but I was able to get a slightly lower, more reliable idle with an O.S. F plug.

FINAL THOUGHTS

Falling between the existing .91 and 1.20, the FA-100's high power-to-weight ratio makes it an attractive choice for those who would like to install more power in their .90 planes without incurring a weight penalty. The new Saito FA-100 reflects the company's years of refinements and continues the traditional high quality and value of the Saito line. Set this engine up properly, and it will provide you with plenty of reliable power for a long time, and as a bonus, you'll have that great 4-stroke sound!

Hangar 9; *distributed by Horizon Hobby.*

Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*

Saito; *distributed by Horizon Hobby.*

SEND IN YOUR EVENT COVERAGE. Mail photos, captions and text (500 words or less) to "Grassroots," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Color slides and prints are acceptable.

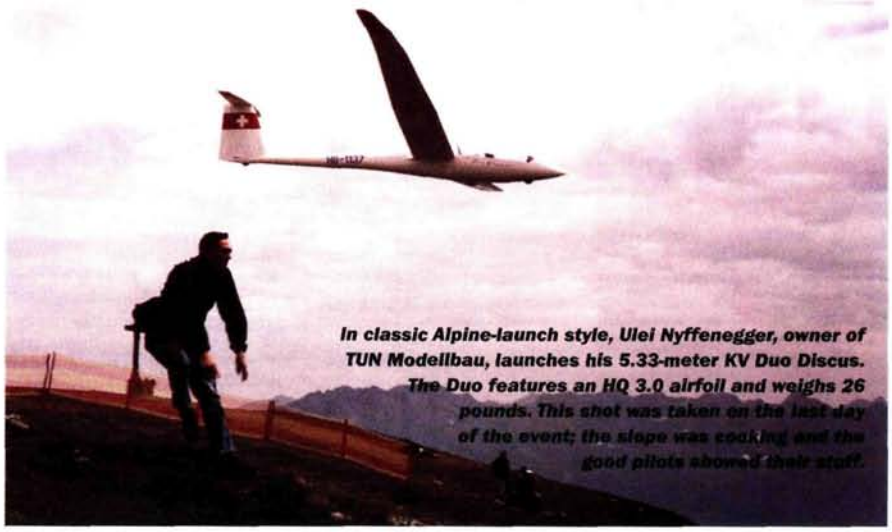
Fiss Alpine soaring

If you've never seen the grace and beauty of true Alpine soaring, you'll find it difficult to appreciate the magnitude of the experience. And anyone who has ever attended the annual Fiss Alpine Soaring event will tell you that slope soaring really doesn't get any better.

Now in its seventh year, Fiss Alpine Soaring is held every summer in southwestern Austria. This mountaintop venue is at 8,200 feet and offers some of the most majestic views on earth. The ground slopes away on three sides of the peak, making wind shifts manageable for most directions. Alpine soaring is not true slope soaring as one might imagine, but rather a combination of slope and thermal soaring with as much emphasis on thermal activity as on slope wind. Much of the soaring is done below the pilots' starting point. When conditions are perfect (ample rising air), the more experienced pilots can dive 1,000 feet towards the valley below and then swoop back up to eye level within seconds on thermal activity and stored energy. Lift is very strong, but so is sink. This is not soaring for the timid, but pilots of every skill level participate—veteran soarers and young boys with hand-launch gliders.

One of the best things about Fiss is that it is a perfect venue for spectators. There were easily as many spectators as there were pilots, and it's always a pleasure to see model aircraft attracting such attention.

When I landed in Munich, the weather was questionable, but by the time we reached Fiss in Austria, the clouds had parted and we enjoyed some of the best weather they had had in recent memory. On Saturday, more than 100 sailplanes took to the slopes.



In classic Alpine-launch style, Ulei Nyffenegger, owner of TUN Modellbau, launches his 5.33-meter KV Duo Discus. The Duo features an HQ 3.0 airfoil and weighs 26 pounds. This shot was taken on the last day of the event; the slope was cooking and the good pilots showed their stuff.

Pilots and photographers congregate at the edge of the slope. There's no need to impose restrictions about the flightline; if you step up too far, you're off the edge.

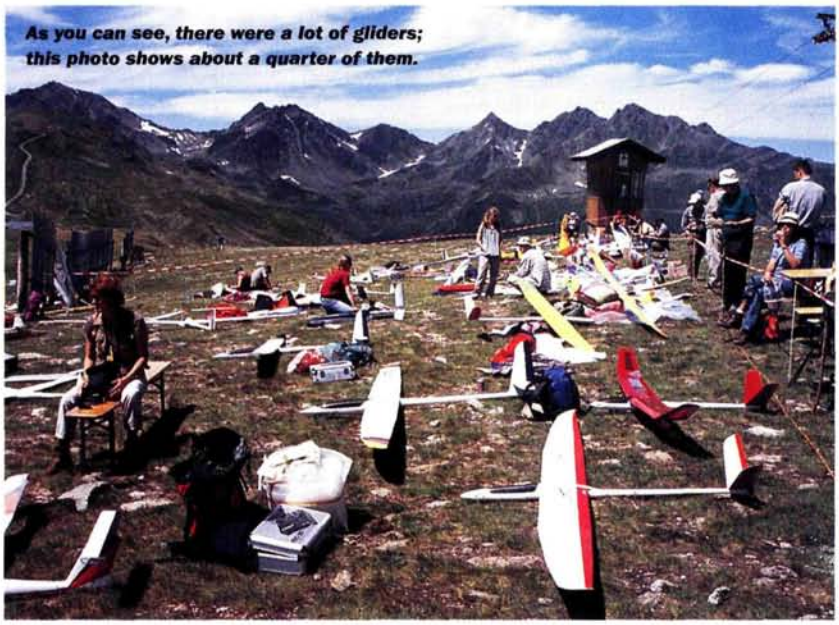
The fully molded EMS DB-1000 sits poised for another flight.

Above: Petr Lasovsky (right), owner of LET Model in the Czech Republic, makes most of the EMS planes. Here, his wife helps him with a Sperber.

Right: this is the only way to the top of the mountain—a 25-minute cable-car ride that's vertical in places. Gliders that were too big for the cable car were put in open freight cars to get them to the top.

The legendary Uwe Gewalt designed and built this 15-year-old 6-meter ASWA 7. The model weighs 25 pounds and has an HQ-3 2.5 airfoil.

The 5.33-meter Duo Discus heads for the valley. In seconds, it dived more than 1,000 feet and then zoomed back up to eye level.



As you can see, there were a lot of gliders; this photo shows about a quarter of them.

Ralf Scheifele and friends make their way down to the cable car at day's end.

Patrick Trauffer and his all-molded 1/3-scale, KV 4.5-meter Pilatus B-4 for Tun Modellbau. The model features a NACA airfoil and weighs 20 pounds. Patrick flew it phenomenally well—and mostly inverted.

Models ranged from hand-launch foamies, F3B ships and small, semi-scale gliders to giant-scale super ships (my favorites).

Gerd Holzner, the man behind the event, is absolutely committed to Alpine soaring, especially with large, 5- to 6-meter, scale ships. Gerd has campaigned to get more large-scale ships into the game at Fiss, and he has persuaded local ski operators to grade a landing zone suitable for large sailplanes. Looking at the landing strip, you might disagree about its suitability, but several 6-meter ships had no difficulty consistently getting down safely and gracefully. The technique requires a good knowledge of the wind and shear conditions (knowledge that experienced pilots were glad to share), allowing for the thinness of the air and having a good wheel brake. The nice thing is that if you miss your landing, you simply go back out over the valley on the other side, gain some altitude and go around again. Of course, soaring in these conditions is extreme, but for experienced pilots, it is very manageable. With smaller, non-scale ships, there is very little risk of missing a landing, and the most damage I saw was ground rash caused by straying off the landing zone's centerline.

If you have a chance to attend an Alpine soaring event, I highly recommend that you do—even if you go only as a spectator, as I did. To be sure, though, next time, I will take a sailplane!

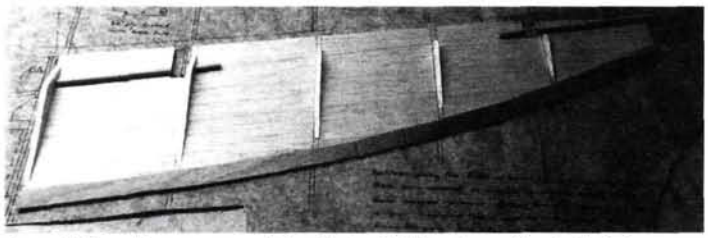
—John Derstine

Secrets to perfect control-surface construction

The design and construction of an airplane's control surfaces, specifically the ailerons and flaps, really help to distinguish a scale model from a sport flyer. This month, let's go back to the building board and take a closer look at these particular elements.

BUILT-UP AILERONS

An aileron can be anything from a simple triangular piece of solid balsa to a completely built-up structure. The most common aileron and flap construction method involves making the wing as a single piece and then cutting the control surfaces out of it. Though this isn't likely to produce the most scale-like surfaces, the method does have its advantages, especially when the wing features washout; the correct amount of washout will have automatically been built in to the control surfaces when the wing was constructed. This ensures a perfect, flush fit when it's time to assemble the pieces. Figure 1 details the building sequence of a typical aileron.



I used Frise ailerons on my Brian Taylor Spitfire; here, they're being constructed.

Also shown in Figure 1 is a small section of what is known as a "Frise aileron." Though slightly more difficult to construct, the Frise aileron more closely resembles that of a full-size plane. With a Frise aileron, the LE drops below the wing when the aileron is deflected; this causes a disturbance in the airflow that minimizes adverse yaw.

Figure 1. Aileron in-wing construction

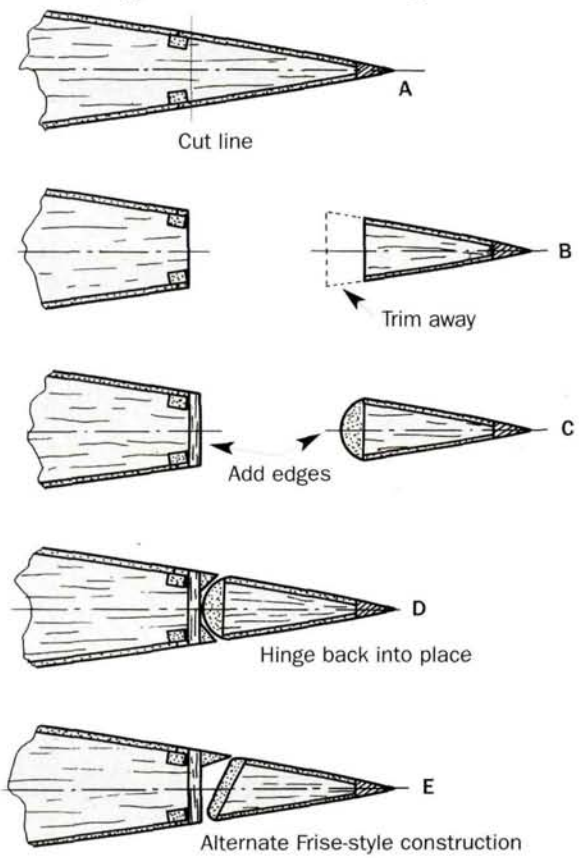
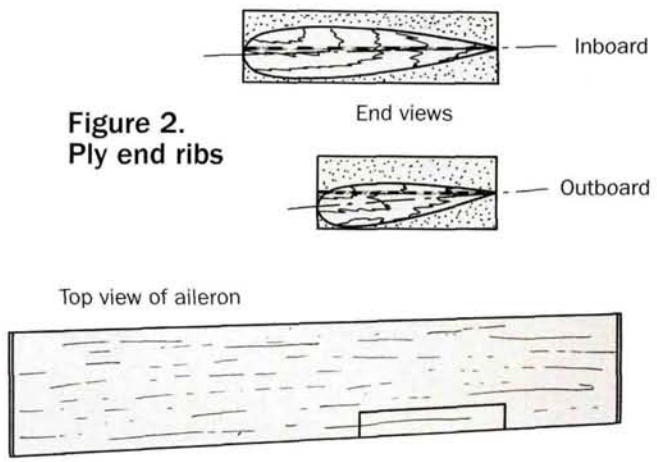


Figure 2. Ply end ribs



SOLID AILERONS WITH WASHOUT

On models such as the P-51 Mustang, which has small ailerons and wing washout, the ailerons must be built separately from the wing. To do so, I first cut a piece of 1/64- or 1/32-inch plywood into the shape of an aileron. I then lighten it as much as possible and cover both sides with hard-balsa sheets of a sufficient thickness. Next, I make two, thin plywood end ribs with the required washout, and I glue them onto each end of the aileron, as shown in Figure 2. Last, I use a razor plane to shape the assembled aileron, and then I sand it with a long sanding bar; the correct washout will automatically be built in.

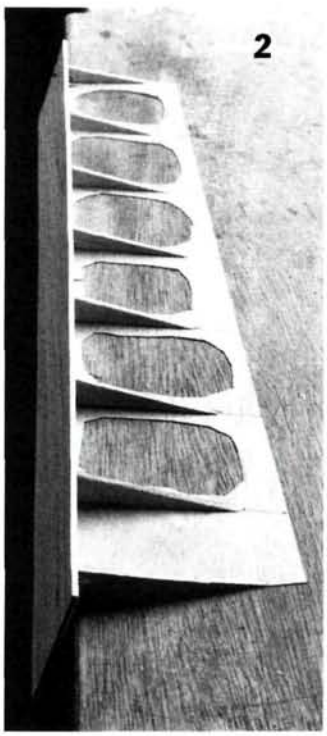
FLAPS

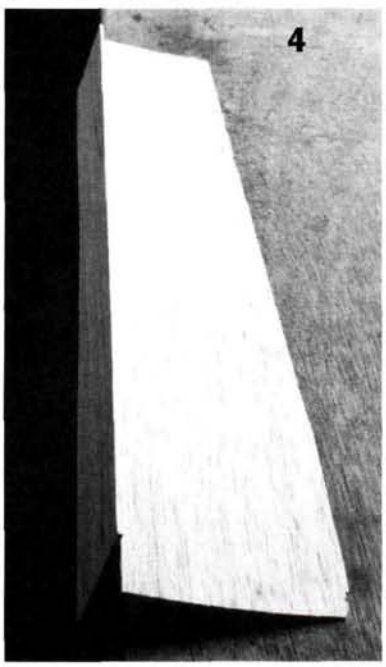
Flap deflection causes two things to happen:

- The wing's angle of attack increases, and this, in turn, generates more lift and enables the aircraft to fly more slowly.
- Drag is increased—behind the flaps and especially at their outer ends. This drag causes the aircraft to descend at a steeper angle. To avoid such a situation, the flaps must be fairly rigid. Unfortunately, the section of the wing in which the flaps usually are is often too thin to support true-to-scale, rigidly constructed flaps, so compromises must be made. One solution is to use split flaps; these are generally built up in a box-like manner to make the lightest, stiffest structure possible. For the stiffest flap, add a laminate made of balsa and plywood. When you're dealing with a very thin airfoil such as that of the Spitfire's, though, it's best to use a laminate made of 1/64-inch plywood glued to an aluminum plate with contact adhesive. I also usually add a 1/4-inch rod and a fiberglass or aluminum tube to the flap's TE to serve as a torsion rod. One advantage of this technique is that it allows the entire structure to bend—a significant benefit considering that the Spitfire's rear wing section is curved.

My Rollason Turbulent's wingtips feature slots to enhance airflow and prevent the wing from tip-stalling.

Another common type of flap is found on the Mustang, the Thunderbolt and many other military and civilian aircraft. Similar in design and construction to the solid ailerons mentioned earlier, these flaps are built right into the wing itself, and when lowered, they affect the appearance of the wing as a whole. To make these stiff but light flaps, I first construct a central core out of 1/64-inch plywood, and then I glue the upper rib halves to it. Then I glue the false LE into place, and this requires total accuracy. It's extremely important that it sits absolutely parallel with the wing and the building board. Next, I tack-glue the flap to the building board with a few drops of CA; then I apply the upper sheeting, and I sand the TE down to ensure a flush fit with the ply core. Next, I attach the LE and TE to the building board with double-sided tape, contact cement, or something similar. Make sure that everything is secure; it's at this stage that a twist could form, and the flap will lose its shape. Now apply the lower sheeting to the underside of the flap to give the structure a definitive shape. After you've sanded and applied the true LE, your flap is ready to be installed.





1. Adding ribs to the bottom sheet.
2. Attaching leading edge.
3. Installing hinge blocks.
4. Adding top sheeting. Now the flap can be sanded to shape.

This is the typical construction of one of the most popular types of flap. It's used on many aircraft, including the Mustang and Thunderbolt.

To accommodate higher flight loads, the flap's hinge blocks and those that support the control horns must be stronger than those used on the rudder and elevator. To attach the blocks, I recommend that you use a good-quality, slow-drying epoxy or thick CA; it's less sensitive to humidity and temperature differences than aliphatic glue.

SLATS AND SLOTS

Another way to increase the amount of lift a wing is able to generate is through the use of slots. A slot is a small, secondary "wing" in the forward part of the wing's LE and mounted at a lower angle of attack than the wing itself. The gap created by this slot forces air to flow over the upper side of the wing and maintains a linear airflow even after the plane has reached its usual

stalling angle. In effect, slots enlarge an aircraft's critical-angle-of-attack range.

My Rollason Turbulent has slots on its wingtips that help to increase airflow over the wingtips and prevent the wing from tip-stalling. Because the Turbulent has a very low top airspeed, I can keep the effects of drag to a minimum. The use of slots is always restricted to aircraft with low flying speeds. Today, they're found mainly on ultralights.

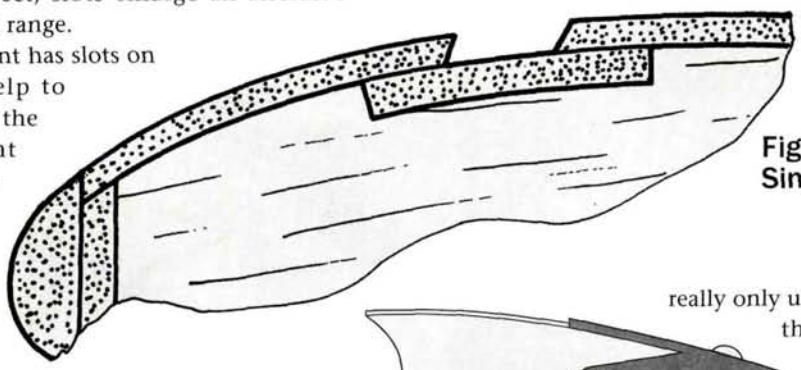


Figure 3.
Simulated slat detail

The use of functional slats on smaller models is questionable because the airflow is unable to follow the small radiuses required to ensure proper performance. It's probably best to build the model with the slats permanently open or closed. For example, the Storch and Lysander are appreciated most for their good, slow-flight capabilities, so such models should feature open slats. But planes such as the Messerschmitt Me-163 are not built to fly low and slow, so it may be better to build the wings without slats and to simulate them as shown in Figure 3. Slots, of course, are a different matter; because they are really only useful on slow models, decisions about their use are limited. Slots and slats, however, do have one thing in common: the bigger the model, the more effective they are.

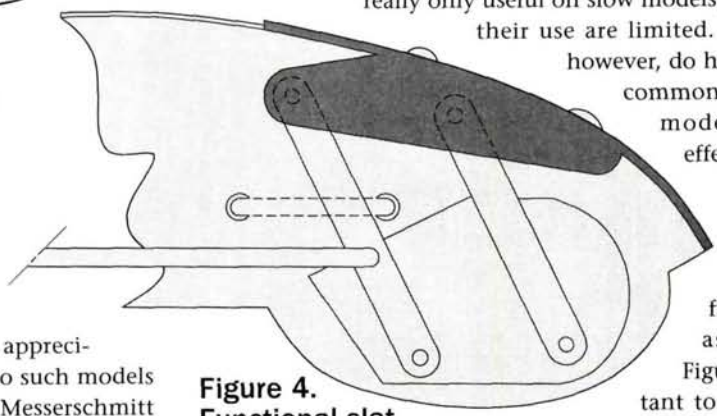


Figure 4.
Functional slat

If you want to, you could equip your model with functioning slats, as shown in Figure 4. It's important to ensure that the hinges are perfectly aligned to prevent the slats from opening spontaneously during flight. For added safety, install a locking mechanism. ✈

PRODUCT WATCH

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

GWS
GWT-4A
Affordable transmitter for first-time flyers

GWS recently entered the transmitter market with the introduction of its new GWT-4A. The GWT-4A is most noteworthy for its affordability; at just $32, it's quite a bargain. It provides 4-channel-control capability, operates on FM (PPM) and is available on all 72MHz channels.

Both beginners and sport fliers will appreciate the simplicity of this transmitter. Each of the four channel functions has a conventional trim lever and a servo-reversing switch that's easily accessible from the front panel. There's a carrying handle on top of the case and a loop to which you can attach a neck-support strap (not supplied). Basically, this is a "no frills" transmitter, and as such, it does not have dual-rate control, endpoint adjustment, or a trainer cable jack.

The GWT-4A is available in two versions: the "F" version operates Futaba, Hitec and GWS receivers; the "J" version is for Airtronics and JR receivers. When ordering, be sure to specify which version you need.

The GWT-4A requires eight AA alkaline batteries, but rechargeable AA-size Ni-Cd cells may also be used. Because the unit does not come with a recharging jack, I simply slip a small strip of brass under the cells and connect it to my charger with alligator clips.

A multicolored LED on the front panel acts as a battery monitor. With fresh batteries, it glows green. As the batteries wear down to 9.1 volts, the LED changes to red, indicating that it is time for the batteries to be replaced. There is no audible warning.

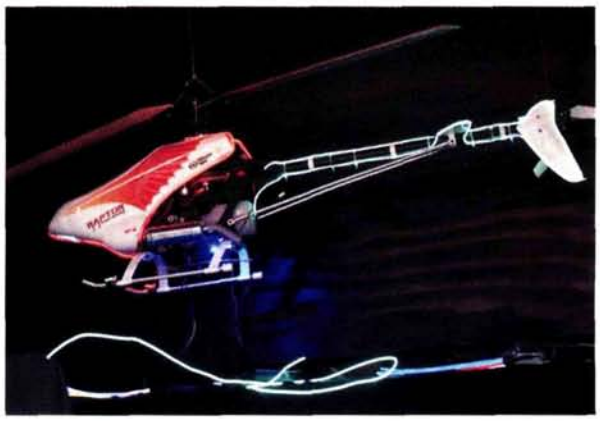
Both beginners and longtime fliers will find something to love about the new GWT-4A from GWS. Beginners will love how little training is required to operate this unit; you'll no longer have to take the manual with you to the flying field. More experienced fliers will welcome the standard trim levers and—of course—will appreciate the low price that makes it possible to own a separate transmitter for each model—no more worrying about model-memory positions. *—Bob Aberle*

GWS; distributed by Balsa Products (732) 634-6131; balsapr.com.

Specifications

Model: GWT-4A ("F" or "J")
Manufacturer: Grand Wing Servo (GWS)
Type: 4-channel FM (PPM)
Price: $32
Features: can be purchased for high- or low-FM deviation (high for JR and Airtronics receivers; low for Futaba, Hitec and GWS receivers); traditional trim levers on all four channels; single LED battery status indicator; servo-reversing switches on all four channels; 350 milliwatts output; current drain of 100mA.

GloWire
Lighting Wires
Light up the night



For some modelers, the best flying time is after the sun has gone down! The air is generally calmer and it's usually cooler—ideal conditions for top-quality flight time. But how do you see your model in the dark? GloWire is the answer! Protected by a colored vinyl tube, these electro-luminescent lighting systems contain a phosphorus-coated copper wire that has two tiny transmitter wires wrapped around it. Powered by a DC power source (9V transistor battery) the GloWire driver converts the voltage to 120 volts AC and makes the element light up like a neon sign. The lighting system consumes very little power: 30 feet of GloWire draw less than 200mA.

Installation is simple; it took about 20 minutes to attach it to my Raptor helicopter. Using clear tape and tie wraps, I installed the driver unit under the canopy and then ran the GloWire around the canopy, the tail boom and the tail fins. A switch on the driver unit turns the GloWire on and off.

Flying my heli at night was exciting, and it was a lot easier than I thought it would be. Keeping my orientation was easy.

Available in kits to suit your needs, GloWire comes in several colors, and because it weighs only a couple of ounces, you can use it on any model aircraft. For $49.95, the .30 heli kit includes the driver unit and two lengths of GloWire (4-foot and 6-foot) in your choice of colors. Light up your nights with GloWire, and expand your flying time. *—Rick Bell*

GloWire (260) 693-0772; glowire.com.

BB Tools Inc.

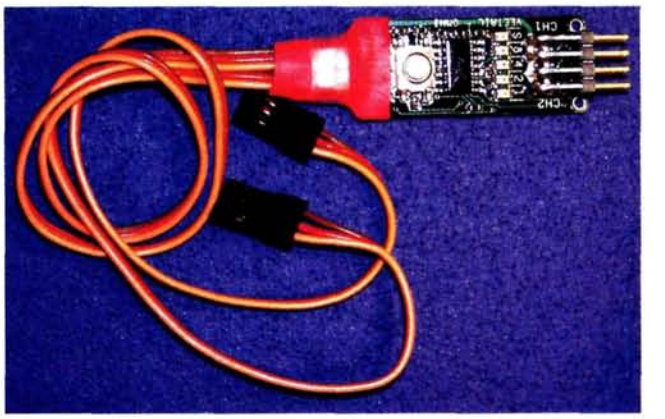
Classic Cutters

Jaws of steel!

Have you ever ruined a pair of wire cutters trying to snip a piece of music wire or braided throttle cable? Ever wish for a better way to cut metal pushrod wire to length? There is—in the form of the Classic Cutter. Available in two sizes, this heavy-duty cutter has unique converging cutting jaws that draw the part being cut into the tool and do not push it out as most other cutters do. The curved, padded handles are comfortable to grip, and the Cutter's body has a corrosion-resistant finish. If you want to make quick work of all your metal wire- and rod-cutting jobs, the Classic Cutter no. 001 (3/32-inch) $16.20, and no. 002 (3/16-inch) $18.20, will be great additions to your toolbox. —*Gerry Yarrish*

BB Tools Inc. (513) 825-5541.

VeeTail
Omni
An onboard mixer and more



I installed the Omni in an electric version of a Goldberg J3 Cub that has a real tendency to float on landing because I wanted the long strip ailerons to double as flaperons. The installation was a snap; use one servo for each aileron and connect each to one of the Omni's channels. It doesn't matter which because you can use the Omni's dual-channel servo-reversing to accommodate your setup.

Next, connect the Omni to the aileron and elevator channels; use the elevator channel for setup instead of the flap channel because you can use the stick to make your adjustments. When you're ready to finish the setup, just move that servo to the flap channel. The configuration is easy thanks to the Omni's step-by-step instructions and single-pushbutton programming.

There are a lot of features packed into the Omni that I didn't take advantage of on the Cub. For example, it offers in-flight warnings for low battery voltage and radio interference, but you'll need strobe lights or other warning devices in addition to the Omni to take advantage of these features. I also liked the Omni's adjustable servo endpoints (which you can extend to 250 percent of normal travel), adjustable neutral setpoint and fail-safe servo positions in the event of signal loss. I plan to use the Omni's adjustable servo rate, which enables you to slow down the rate for retracts, in a P-51 I'm building.

The dual-channel Omni works with older-style pulse radios as well as newer systems, and it's easy to calibrate to your radio. It also comes with an excellent manual. You'll have a hard time finding a single device that does everything the Omni can do, and at a suggested retail price of $55, the Omni probably does it cheaper anyway. *—Jim Boyce*

VeeTail fax (520) 743-8430; veetail.com.

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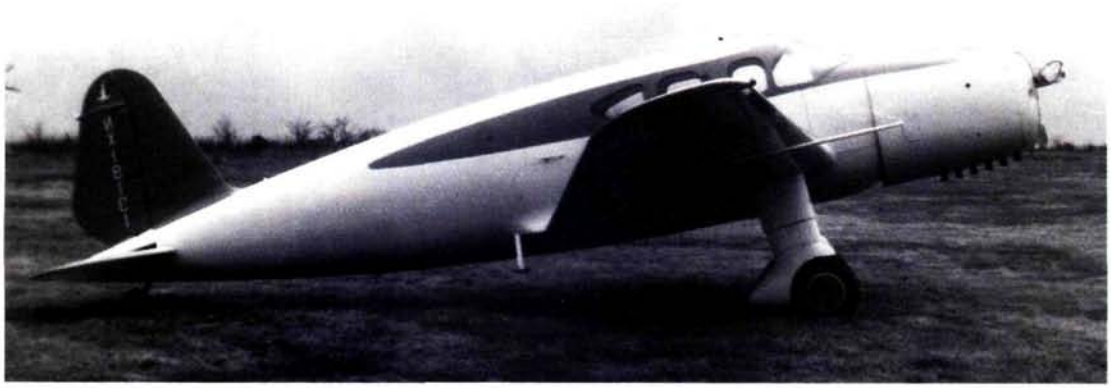
NAME THAT PLANE

Can you identify this aircraft?

SEND YOUR ANSWER to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.



Congratulations to Ernest Holomany of Brookfield, CT, winner of January's "Name That Plane" contest. Ernest was able to correctly identify the mystery plane as the English Electric Co. Canberra, Britain's first turbojet-powered bomber and the first of its kind to serve in the Royal Air Force. First flown in May 1949, the prototype was designed for a two-person crew and relied on radar for accurate bomb delivery. Production versions, however, carried a crew of three and were configured for visual bombing. The Mk. 2, shown here, was powered by two Rolls Royce Avon jet engines and was capable of internally carrying 6,000 pounds of conventional and nuclear weapons. Subsequent conversions eventually produced many variants, and over the years, the Canberra has been supplied to many air forces. It has the distinction of being the only British-designed modern aircraft to be license-built in the United States. ✈

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will be given a free, one-year subscription extension.

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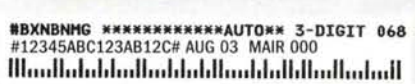

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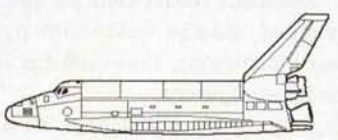

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BY JIM COLLIN

½-scale electric Air-Bike

A few years ago, a good friend sent away for literature about the Air-Bike from Tennessee Engineering and Manufacturing; he dreamed of building and flying the real thing. He told me about this one day at the field, and I fell in love with the plane the moment I saw the brochure. An Internet search turned up some 3-views, photos and a host of other information.

Jim Collin's ½-scale, electric-powered Air-Bike turns heads wherever it flies. Jim designed and scratch-built the model and its pilot using 3-views and photos he found on the Internet. He remarks that the plane is a stable aircraft that's a lot of fun to fly.

Before I could start construction, though, I had to answer some critical questions. For instance, would the ½-scale model fit inside my van? I took a few measurements, and it looked tight but doable. Also, because 90 percent of this airplane's charm is its pilot and exposed Rotax engine, I wondered whether I could make a ½-scale pilot and dummy engine that would look good yet still be light. I decided to use foam and water-based paints for these parts.

The pilot figure was first on the list. I made it out of foam, with fully articulated joints so that it can be positioned properly in the model. The dummy Rotax was next; I also made this out of foam and then painted it and the pilot with water-based paint. I cut up an old shirt and a pair of pants to use for his clothes. I was very pleased to have two big items out of the way, and at 26 ounces, the combined weight of these essential scale details seemed quite reasonable.

I used fiberglass tube for the airframe. To provide a "welding" effect, I fitted each joint first and then epoxied it into place. As you might imagine, I needed a lot of jigs and fixtures to keep the assembly aligned while the epoxy dried! Although I built the model's tail feathers using conventional techniques, the 13-foot-span wings are another story. Because they have more than 4,000 square inches of area, I really had to think about how to design them. I decided to use only four pieces of ⅛-inch-thick lite-ply in the wing: the root ribs, servo mounts and the strut mounts. All of the other ribs are 1/16-inch-thick balsa, while the spars are a balsa box with ¼x¾-inch capstrips and 1/16-inch sheet shear webs. The rear spars are ¼-inch-square caps with 1/16-inch shear webs. Eight rolls of TowerKote complete the wing construction. The functional wing struts are made of fiberglass tube, and the wings are mounted on the fuselage with pinned brackets, just as they are on the full-size plane. The landing gear is ¼-inch spring steel in a fiberglass tube.

The radio gear is behind the pilot in a ½-scale foam Igloo cooler. The pilot's seat is also foam and hides the 28-cell motor battery. Because every pilot needs a safety belt, I made one out of a camera strap and lithoplate.

To power the 26-pound model, I use a geared AstroFlight cobalt 90 motor that's controlled by a New Creations Ultra Sport 2500 ESC. With 28, 3000mAh NiMH cells for juice, the motor spins my hand-carved, 33x24 basswood prop at 1,700rpm. Four servos (two for ailerons, one each for rudder and elevator) round out the RC equipment.

My Air-Bike is a fun airplane to fly, and I hope to have it around for quite a while. ✈